

CITY OF BEAUMONT, TEXAS
CONTRACT DOCUMENTS
FOR CONSTRUCTION OF
PINE STREET SWTP POLYMER
SYSTEM AND CHEMICAL STORAGE
TANK IMPROVEMENTS



JANUARY 2022
ISSUED FOR BID


APPROVED BY:




Blake Fredieu
Water Utilities Designer II



John Pippins III, EIT
Water Utilities Design Manager



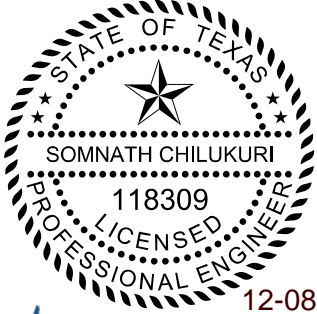

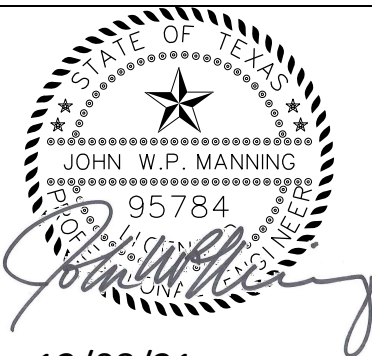
Amalia Villarreal, P.E.
City Engineer



Bart Bartkowiak
Director of Public Works and Technology Services


Texas Registered Engineering Firm F-2144
BMT21704
City Bid No. WU0122-12

00 01 07 DESIGN PROFESSIONAL SEALS

<div><p>12-08-2021</p><p><i>Somnath Chilukuri</i></p><p>FREESE AND NICHOLS, INC. TEXAS REGISTERED ENGINEERING FIRM F-2144</p></div>	<div><p>Specification Sections Sealed</p><p>Divisions 00-02, 09, 22, 31, 33, 40, 44, and 46</p></div>
<div><p>12/08/2021</p><p><i>Michael R. Robertson</i></p><p>FREESE AND NICHOLS, INC. TEXAS REGISTERED ENGINEERING FIRM F-2144</p></div>	<div><p>Specification Sections Sealed</p><p>Divisions 03 and 05 Specifications 01 40 01, 31 05 13, 31 05 16, 31 23 10, and 31 23 23.34</p></div>
<div><p>12/08/21</p><p><i>John W.P. Manning</i></p><p>FREESE AND NICHOLS, INC. TEXAS REGISTERED ENGINEERING FIRM F-2144</p></div>	<div><p>Specification Sections Sealed</p><p>Divisions 26 and 40</p></div>

END OF SECTION

00 01 10 TABLE OF CONTENTS

Section	Title
Division 00	Procurement and Contracting Requirements
00 01 01	Project Cover Sheet
00 01 07	Design Professional Seals
00 01 10	Table of Contents
00 11 16	Invitation to Bid
00 21 13	Instructions to Offerors
00 21 14	Required Forms Checklist
00 41 13	Bid Form
00 41 16	Bid Form Exhibit A
00 43 13	Bid Bond
00 45 02	Non-Collusion Certification
00 45 03	Conflict of Interest Questionnaire
00 45 04	State Sales Tax Requirements
00 45 13	Qualifications Statement
00 52 13	Agreement
00 61 13	Performance Bond
00 61 16	Payment Bond
00 61 19	Maintenance Bond
00 61 20	Maintenance Bond Requirements
00 70 01	Notice of Award
00 70 02	Notice to Proceed
00 72 00	General Conditions
00 73 00	Supplementary Conditions
00 73 16	Insurance Requirements
00 73 16.1	Insurance Requirement Affidavit
00 73 16.2	Certificate of Insurance Form (Form COB1)
00 73 17	Texas Workers' Compensation Insurance
00 73 43	Wage Rate Requirements
00 73 46	Wage Determination Schedule
00 73 47	Statement of City Charter
00 73 48	Corporate Resolution
00 73 50	Minority Business Enterprise Program
00 73 51	Certificate of Interested Parties Information
Division 01	General Requirements
01 11 00	Summary of Work
01 26 00	Change Management
01 29 00	Application for Payment Procedures
01 29 01	Measurement and Basis for Payment
01 31 00	Project Management and Coordination

Section	Title
01 31 13	Project Coordination
01 33 00	Document Management
01 33 01	Document Register
01 33 02	Shop Drawings
01 33 03	Product Data
01 33 04	Operation and Maintenance Data
01 33 05	Construction Progress Schedule
01 33 06	Graphic Documentation
01 35 00	Special Procedures
01 40 00	Quality Management
01 40 01	IBC Special Inspections
01 50 00	Temporary Facilities and Controls
01 57 00	Temporary Controls
01 57 23	Temporary Stormwater Pollution Control
01 60 00	Product Requirements
01 70 00	Execution and Closeout Requirements
01 74 23	Final Cleaning
01 75 00	Starting and Adjusting
Division 02	Existing Conditions
02 41 00	Demolition
Division 03	Concrete
03 11 00	Concrete Forming
03 21 00	Reinforcing Steel
03 30 00	Cast-In-Place Concrete
Division 05	Metals
05 50 00	Metal Fabrications
05 53 00	Metal Gratings
Division 09	Finishes
09 96 00.01	High-Performance Coatings
Division 22	Plumbing
22 14 29.16	Submersible Sump Pumps
Division 26	Electrical
26 01 26	Testing of Electrical Systems
26 05 19	Low Voltage Electrical Power Conductors and Cables
26 05 23	Control-Voltage Electrical Power Cables
26 05 26	Grounding and Bonding for Electrical Systems

Section	Title
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 22 13	Low-Voltage Distribution Transformers
26 24 16	Panelboards
Division 31	Earthwork
31 05 13	Soils for Earthwork
31 05 16	Aggregates for Earthwork
31 11 00	Clearing and Grubbing [Civil]
31 23 10	Structural Excavation and Backfill
31 23 23.34	Flowable Fill
31 23 33	Trenching and Backfill [Utilities]
31 23 33.14	Trench Safety
Division 33	Utilities
33 01 02	Piping Specialties
33 05 01.09	Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
Division 40	Process Integration
40 05 43	Miscellaneous Valves
40 05 53	Identification for Process Piping and Equipment
40 90 01	Instrumentation
Division 44	Pollution and Waste Control Equipment
44 42 73	Chemical Storage Tanks
Division 46	Water & Wastewater Equipment
46 33 41	Chemical Feed Pumps

END OF SECTION

00 11 16 INVITATION TO BID

ARTICLE 1 – GENERAL NOTICE

- 1.01 The City of Beaumont (Owner) is requesting Bids for the construction of the following Project:
Pine Street SWTP Polymer System and Chemical Storage Tank Improvements
Bid No. WU0122-12
- 1.02 Description of the Work
- A. This project consists of flood protection improvements at the water treatment plant, including, but not limited to:
1. Modifications to the Bulk Chemical Storage Facility including structural expansion, demolition, new storage tanks, pumps, piping, and associated electrical and instrumentation improvements
 2. Replacement of ammonia day tank in Chemical Feed Building
 3. Modifications to the polymer storage and feed system including demolition of existing storage drums and scales, replacement of feed pumps, and addition of flow meters, and associated piping, electrical, and instrumentation improvements.
 4. Ramp modifications at Chemical Feed Building
- 1.03 The Project is to be substantially complete and ready for operation within 270 days from authorization to proceed. The Project is to be complete and eligible for final payment 60 days after the date for Substantial Completion.

ARTICLE 2 – EXAMINATION AND PURCHASE OF DOCUMENTS

- 2.01 Advertisement and bidding information for the Project can be found at the following procurement or the City's website:
www.civcastusa.com
<https://beaumonttexas.gov/departments/purchasing/bid-information/>
- 2.02 Prospective Offerors must register with the procurement website as a plan holder, even if the Contract Documents are obtained from a plan room or other site. All official notifications, Addenda, and other documents will be offered only through the procurement website.
- 2.03 The Contract Documents may be downloaded from the procurement website by prospective Offerors registered as plan holders. Offerors are responsible for ensuring that a complete set of documents, as defined in Section 00 52 13 "Agreement," are used in the preparation of their Bids. The documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download does not confer a license or grant permission or authorization for any other use. Authorization to download documents includes the right for Offerors to print documents for their sole use, provided they pay all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.04 The procurement website will be updated periodically with Addenda, lists of interested parties, reports, or other information relevant to submitting a Bid for the Project.

- 2.05 Printed copies of the Contract Documents, Technical Data, and other information may be examined free of charge at the following address:

City of Beaumont
1350 Langham Road
Beaumont, TX 77707
Hours Available for Viewing: 8 AM to 5 PM

ARTICLE 3 – PRE-BID CONFERENCE

- 3.01 A mandatory pre-bid conference for the Project will be held on February 23, 2022 at 1:30 PM at the following location:

City of Beaumont
801 Main Street
1st Floor Conference Room
Beaumont, TX 77701

ARTICLE 4 – SITE TOUR

- 4.01 A tour of the Site will be held the afternoon of the pre-bid conference. Prospective Offerors attending this site tour are required to arrange their own transportation to the Site. Maps to the Site will be available at the pre-bid conference.

ARTICLE 5 – QUESTIONS REGARDING BIDDING PROCESS OR SOLICITATION DOCUMENTS

- 5.01 Questions are to be submitted using the question and answer process on the procurement website. Responses to questions posted on the procurement website will be posted for the benefit of all Offerors. A response will be posted for questions submitted until 2:00 p.m. on February 25, 2022.
- 5.02 A response to a question posted on the procurement website that requires modification of the Contract Documents will be made by Addenda. Modifications to the Contract Documents prior to the award of the Contract can only be made by Addenda. Only answers in Addenda posted on the procurement website will be binding. Oral and other interpretations or clarifications will be without legal effect.

ARTICLE 6 – BID SECURITY

- 6.01 Offerors must submit an acceptable Bid Security with their Bids as a guarantee that the Successful Offeror will enter into a contract for the Project with the Owner within 15 days of Notice of Award of the Contract. The Bid Security must be payable to City of Beaumont in the amount of 5 percent of the proposed Contract Price. The Successful Offeror must execute the Contract and bonds on the forms provided in the Contract Documents and provide evidence of insurance as required by the Contract Documents.
- 6.02 Bid Security may be in the form of a bid bond, a cashier's check, or certified check. Checks must be made out to City of Beaumont. The bid bond may be submitted on the form provided in Section 00 43 13 "Bid Bond" or Offerors may provide their surety's standard penal sum bid bond form. The bid bond must reference the Owner and Project by name as identified in this Section.

ARTICLE 7 – DELIVERY OF BIDS

- 7.01 Sealed Bids must be delivered to the Owner at the address below no later than March 3, 2022 at 2:00 p.m. to be accepted. The Bids will be publicly opened and read aloud at this time and place including the names of the Offerors and their Bids. Bids received after this time will be returned unopened. Address Bids to the Owner as follows:

City of Beaumont

Tina Broussard, City Clerk

Attn: Bid – Pine Street SWTP Polymer System and Chemical Storage Tank Improvements [Bid No. WU0122-12]

801 Main Street, Suite 125

Beaumont, TX 77701

ARTICLE 8 – AWARD OF CONTRACT

- 8.01 It is the intent of the Owner to award this Contract to the lowest responsible Offeror. The Owner reserves the right to adopt the most advantageous interpretation of the Bids submitted in the case of ambiguity or lack of clearness in stating bid prices, to reject any or all Bids, and/or waive formalities. Bids will remain subject to acceptance and may not be withdrawn within 90 days from the date on which Bids are opened.

ARTICLE 9 – OTHER CONTRACT REQUIREMENTS

- 9.01 Selected Contractor will be required to pay the prevailing wage rates established for this Project in accordance with the Contract Documents and Tex. Gov't Code Chapter 2258.
- 9.02 Performance, payment, and maintenance bonds will be required for this Project.

END OF SECTION

00 21 13 INSTRUCTIONS TO OFFERORS

ARTICLE 1 – DEFINED TERMS

- 1.01 The terms used in these Instructions to Offerors have the meanings assigned to them in the General Conditions and Supplementary Conditions.

ARTICLE 2 – RECEIPT OF BIDS

- 2.01 Refer to Section 00 11 16 “Invitation to Bid” for information on receipt of Bids.

ARTICLE 3 – COPIES OF CONTRACT DOCUMENTS

- 3.01 Obtain a complete set of the Contract Documents as indicated in Section 00 52 13 “Agreement.”
- 3.02 Use complete sets of Contract Documents in preparing Bids. Offeror assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.
- 3.03 Owner makes copies of Contract Documents available for the sole purpose of obtaining Bids for completion of the Project and does not confer a license or grant permission or authorization for any other use.

ARTICLE 4 – QUALIFICATIONS STATEMENT

- 4.01 Submit information as required in Section 00 45 13 “Qualifications Statement” within 5 days of the date Bids are due if requested to do so by the Owner.

ARTICLE 5 – EXAMINATION OF THE CONTRACT DOCUMENTS AND THE SITE

- 5.01 Examine the Contract Documents, the Site, and other information readily available before submitting a Bid.
- A. Examine the Contract Documents and supplemental data:
1. Carefully study the Contract Documents.
 2. Carefully study supplemental information, including Technical Data, record drawings from previous projects, available utility maps, reports, and studies referenced or made available to the Offeror.
 3. Promptly notify the Construction Manager of all conflicts, errors, ambiguities, or discrepancies that the Offeror discovers in the Contract Documents, Addenda, and supplemental information.
 4. Determine that the Contract Documents, Addenda, and supplemental data are generally sufficient to indicate and convey understanding of all terms and conditions for completion of Work to the degree necessary to prepare a Bid for the Project.
 5. Make observations and investigations, correlate knowledge and observations with the requirements of the Contract Documents, and consider these in preparation of a Bid for the Project.

- B. Become familiar with all federal, state, and local Laws and Regulations that may affect cost, progress, or the completion of Work.
- C. Visit the Site to become familiar with any general, local, or Site conditions that may affect the cost, progress, or performance of the Work in any manner. A tour of the Site will be conducted at the pre-bid conference.
- D. Subsurface exploration using a backhoe, drilling rig, or other equipment can be done, providing the following procedures are followed:
 - 1. Contact the following individual to coordinate the details for the subsurface exploration:

Troy Pierce – Plant Manager
City of Beaumont
Troy.Pierce@BeaumontTexas.gov
 - 2. Backfill excavation with material acceptable to the Owner and process backfill to prevent future settling.
 - 3. Pay all costs for soils investigation including the cost for excavation, backfill, access, and testing.
- E. The submission of a Bid will constitute an incontrovertible representation by the Offeror that the Offeror has complied with every requirement of this Article, and that without exception the Bid is premised on the following:
 - 1. Work will be completed in accordance with the Contract Documents for the Contract Price within the Contract Times;
 - 2. Offeror has given the Construction Manager written notice of all conflicts, errors, ambiguities, and discrepancies that the Offeror has discovered in the Contract Documents, Addenda, and the related supplemental data;
 - 3. Written resolutions provided by the Construction Manager are acceptable to the Offeror; and
 - 4. Contract Documents, Addenda, and the related supplemental data are generally sufficient to indicate and convey understanding of all terms and conditions for completion of Work.

ARTICLE 6 – PRE-BID CONFERENCE

- 6.01 A mandatory pre-bid conference will be held at the time and location indicated in Section 00 11 16 “Invitation to Bid.”

ARTICLE 7 – INTERPRETATIONS AND ALTERNATE BIDS

- 7.01 Submit all questions about the meaning or intent of the Contract Documents, Addenda, and the related supplemental data to the Construction Manager using the procurement website as indicated in Section 00 11 16 “Invitation to Bid.”
- 7.02 Submit any offer of alternate terms and conditions or offer of Work not in strict compliance with the Contract Documents to the Construction Manager no later than 10 days after the date

Project is advertised. Construction Manager and Design Professional will issue Addenda as appropriate if any of the proposed changes to the Contract Documents are accepted. A Bid submitted with clarifications or taking exceptions to the Contract Documents, except as modified by Addenda, will be considered non-responsive.

- 7.03 Offeror may submit a separate and additional Bid if the Offeror includes exceptions or the Offeror wishes to make a Bid that is not in accordance with the terms and conditions of the Contract Documents, or for Work that is not in strict compliance with the Contract Documents. Describe the intent and substance of the changes in the additional Bid in adequate detail so they are clearly understood. Alternate Bids will not be considered in the evaluation of the Bids. Upon selection of the Bid of the lowest responsible Offeror, and after the award of the Contract, the Construction Manager may issue a Request for a Change Proposal if Owner chooses to accept any Bid alternates.
- 7.04 Addenda may be issued to clarify, correct, or change the Contract Documents, Addenda, or the related supplemental data as deemed advisable by the Owner or Designer.

ARTICLE 8 – BID SECURITY

- 8.01 Offerors must submit an acceptable bid bond, cashier's check, or certified check as Bid Security with their Bids as required by Section 00 11 16 "Invitation to Bid." The acceptable bid bond must be issued by a surety legally authorized to do business in Texas and meet the requirements of the General Conditions. Cashier's or certified checks must be made payable to the City of Beaumont and are to be effective on the day Bids are submitted and valid for a period of at least 90 days from the date the check is issued.
- 8.02 Owner may annul the Notice of Award and retain the Bid Security of the apparent Successful Offeror upon Offeror's failure to execute and deliver the Agreement or Amendments to the Agreement.
- 8.03 Bid Securities are to remain in effect until the Contract is executed. Bid bonds will become void when the Contract is awarded, or all Bids are rejected. Cashier's or certified checks will be returned by the Owner when the Contract is executed, or all Bids are rejected.

ARTICLE 9 – CONTRACT TIMES

- 9.01 See applicable provisions for Contract Times in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES, RETAINAGE, AND INTEREST

- 10.01 Provisions for liquidated damages and the payment of retainage and interest are set forth in the Agreement.

ARTICLE 11 – PREPARATION OF THE BID FORM

- 11.01 The Bid Form is included with the Contract Documents and is also available at the procurement website. Complete all blanks on the Bid Form by typing or printing in ink. Indicate prices for each item or alternate shown in the Bid Form.
- 11.02 Execute the Bid Form as indicated in the document and include evidence of authority to sign.

- 11.03 Acknowledge receipt of all Addenda by filling in the number and date of each Addendum. Provide a signature as indicated to verify that the Addenda were received. A Bid that does not acknowledge the receipt of all Addenda may be considered non-responsive.
- 11.04 Provide the name, address, and telephone number of the individual to be contacted for any communications regarding the Bid in the Bid Form.
- 11.05 Provide evidence of the Offeror's authority and qualification to do business in Texas or agree to obtain such qualification prior to award of the Contract. Failure to obtain this qualification will render the Bid non-responsive and Offeror will forfeit its Bid Security.

ARTICLE 12 – CONFIDENTIALITY OF BID INFORMATION

- 12.01 The Owner is a governmental body subject to the limitation of Tex. Gov't Code Chapter 552 and has limited obligations with regard to protecting confidential information submitted by Offerors. Bids will be opened in a manner that avoids disclosure of trade secrets and confidential information to competing Offerors and keeps the Bids from the public until a contract is awarded. The Owner will protect trade secrets and confidential information to the extent allowed by Laws and Regulations.
- 12.02 Clearly indicate which specific documents are considered to be trade secrets or confidential information by stamping or watermarking all such documents with the word "confidential" prominently on each page or sheet or on the cover of bound documents. Place "confidential" stamps or watermarks so that they do not obscure any of the required information on the document, either in the original or in a way that would obscure any of the required information in a photocopy of the document. Submit all confidential information in a different binder so this confidential material is separate for the rest of the Bid.
- 12.03 The Owner, upon receiving an application or other request for the disclosure of confidential information, will promptly notify Offeror of the request as required by Section 552.305 and request a ruling by the Texas Attorney General as to whether any such information may be released.
- 12.04 Offeror acknowledges and agrees that it will be solely responsible for submitting any arguments, authorities, or other information to the Attorney General of Texas regarding release of the information marked as confidential as provided by Section 552.305(b) and that if disclosure is required, the Owner has no liability for releasing this information and Offeror will not be entitled to exercise any remedy for a disclosure made pursuant to the Chapter 552.
- 12.05 The obligations of the Owner as recipient with respect to confidential information under the terms of this Agreement are subject to the following exceptions:
 - A. If confidential information becomes a part of the public domain through publication or otherwise but through no fault of the Owner;
 - B. Owner can demonstrate through suitable documentation that the confidential information was already in the Owner's possession or otherwise publicly available prior to the date of disclosure hereunder;
 - C. The confidential information is subsequently disclosed to the Owner by a third party who has a lawful right to disclose such information; or

- D. The Owner is required to disclose the confidential information by court order or by applicable law.
- 12.06 If the Owner is requested or becomes legally compelled (by oral questions, interrogatories, requests for information or documents, subpoena, civil or criminal investigative demand, public information requests, including requests under Chapter 552, or similar process) or is required by a regulatory body to make any disclosure that is prohibited or otherwise constrained by this Agreement, the Owner will provide Offeror with prompt notice of this request so that it may seek an appropriate protective order or other appropriate remedy.

ARTICLE 13 – DELIVERY OF BIDS

- 13.01 Complete and deliver the Bid Form along with all required documents identified in the Bid Form.
- 13.02 Submit the Bid no later than the date and time prescribed and at the place indicated in Section 00 11 16 “Invitation to Bid.” Enclose the Bid in an opaque sealed envelope plainly marked with the Project name and the name and address of the Offeror, along with the Bid Security and other required documents. Enclosed the sealed envelope containing the Bid in a separate envelope plainly marked on the outside with the notation “BID ENCLOSED” if the Bid is sent by mail or other delivery system. Address the outer envelope to the mailing address shown in Section 00 11 16 “Invitation to Bid.” Offeror assumes full responsibility for ensuring that the Bid arrives at the prescribed location before the prescribed time.

ARTICLE 14 – MODIFICATION OR WITHDRAWAL OF BIDS

- 14.01 Modify or withdraw a Bid using a document executed in the same manner that a Bid must be executed. Deliver the document to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 14.02 An Offeror may withdraw its Bid within 24 hours after Bids are opened if the Offeror files a signed written notice with the Owner and promptly thereafter demonstrates to the reasonable satisfaction of the Owner that there was a material and substantial mistake in the preparation of its Bid. The Bid Security will be returned if it is clearly demonstrated to the Owner that there was a material and substantial mistake in its Bid. An Offeror that requests to withdraw its Bid under these conditions may be disqualified from responding to a reissued Invitation to Bid for the Work to be furnished under these Contract Documents.

ARTICLE 15 – OPENING OF BIDS

- 15.01 Bids will be opened at the time and place indicated in Section 00 11 16 “Invitation to Bid.” The Owner will publicly acknowledge receipt of Bids received in time to be considered and then open and read aloud the names of the Offerors and the amount bid as required by applicable Laws and Regulations.

ARTICLE 16 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 16.01 All Bids will remain subject to acceptance for the number of days specified in Section 00 11 16 “Invitation to Bid.” The Owner may, at its sole discretion, release any Bid and return the Bid Security prior to the end of this period.

ARTICLE 17 – EVALUATION OF BIDS

- 17.01 The Owner will consider the proposed Contract Price and Contract Times and the qualifications of the Offerors to determine the lowest responsible Offeror.
- 17.02 Owner may conduct such investigations as it deems necessary to establish the responsibility, qualifications, and financial ability of consultants, individuals, or entities proposed to furnish parts of the Work in accordance with the Contract Documents.
- 17.03 Each Offeror agrees to waive any claim it has or may have against the members of the OPT and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any Bid.
- 17.04 Notwithstanding any other provision of the Contract Documents, it is stipulated and agreed that by accepting a Bid, the Owner has not and does not waive its sovereign immunity from suit and/or liability.

ARTICLE 18 – AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any and all Bids, including non-conforming, non-responsive, or conditional Bids. The Owner may also reject the Bid of any Offeror if the Owner believes that it would not be in the best interest of the Owner to make an award to that Offeror. The Owner reserves the right to waive all formalities.
- 18.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered, except as additional Bids in accordance with Article 7. Reasonable grounds for believing that any Offeror has an interest in more than one Bid for the Work will be cause for disqualification of that Offeror and the rejection of all Bids in which that Offeror has an interest.
- 18.03 The Contract will be awarded to the lowest responsible Offeror if a contract is to be awarded.
- 18.04 Owner may consider the following in evaluating the Bids and awarding the Contract:
 - A. Offeror's qualifications and ability to demonstrate current capability to complete the Project in conformance with the requirements of the Contract Documents.
 - B. Compliance of the Bids with requirements of the Contract Documents.
 - C. Alternates and unit prices if requested in the bid forms.
 - D. The amount bid.
 - E. Proposed date of completion and the ability to meet intermediate Milestones that may have been established for the Project.

ARTICLE 19 – BONDS AND INSURANCE

- 19.01 The General Conditions set forth the Owner's requirements as to bonds and insurance. When the Successful Offeror delivers the executed Agreement to the Owner, it must be accompanied by the performance and payment bonds and required evidence of insurance.
- 19.02 Provide performance and payment bonds for this Project that fully comply with the provisions of Tex. Gov't Code Chapter 2253. Administration of these bonds will conform to Chapter 2253 and the provisions of the Contract Documents.

ARTICLE 20 – SIGNING OF THE AGREEMENT

- 20.01 The Notice of Award to the Successful Offeror will be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents that are identified in the Agreement. The Successful Offeror must sign and deliver the required number of counterparts of the Agreement and attached documents to the Owner within 15 days. The Owner will deliver two fully signed counterparts to the Successful Offeror within 10 days after receiving the signed documents from the Successful Offeror.
- 20.02 The Successful Offeror must also complete and submit a Certificate of Interested Parties (Form 1295) to the Owner as required by Tex. Gov't Code Chapter 2252 with the signed Agreement.

ARTICLE 21 – SALES AND USE TAXES

- 21.01 The Owner generally qualifies as a tax-exempt agency as defined by the statutes of the State of Texas and is usually not subject to any local or state sales or use taxes, however certain items such as rented equipment may be taxable even though Owner is a tax-exempt agency. Offerors assume responsibility for including any applicable sales taxes in their Bids and for complying with all applicable statutes and rulings of the State of Texas Comptroller.
- 21.02 It is the Owner's intent to have this Contract qualifies as a "separated contract." In order for this Contract to qualify:
- A. Obtain a sales tax permit from the State of Texas Comptroller if awarded this Contract.
 - B. Identify the dollar value of materials exempt from the sales tax. This information must be reported in Section 00 45 04 "State Sales Tax Requirements." Bids that do not include the information requested in this Section may be considered non-responsive.

ARTICLE 22 – WAGE RATES

- 22.01 This Contract is subject to Tex. Gov't Code Chapter 2258 concerning payment of prevailing wage rates. Requirements for paying the prevailing wage rates are discussed in Section 00 73 43 "Wage Rate Requirements." A schedule listing the minimum wage rates for various classifications of laborers which have been established by the Owner for this Project are included in Section 00 73 46 "Wage Determination Schedule." Offerors will be required to pay at least the minimum wages shown on this list and comply with all applicable federal, state, and local Laws and Regulations related to the payment of prevailing wage rates.

ARTICLE 23 – PROHIBITED CONTRACTS

- 23.01 Owner may not enter into contracts with companies that are engaged in business with Iran, Sudan, or a company known to have contracts with or provide suppliers or services to a foreign terrorist organization in accordance with Tex. Gov't Code Chapter 2252 or a company boycotting Israel in accordance with Tex. Gov't Code Chapter 2270.

END OF SECTION

Certificate of Interested Parties Information (Form 1295)

Texas' New Certificate of Interested Parties (Form 1295) – How do you comply?

Does your Firm enter into contracts with governmental entities or state agencies in the state of Texas? If so, then be prepared to determine if you must complete and file a Form 1295 the next time your Firm submits a contract for professional services to be signed by a governmental entity or state agency in the state of Texas. If required to be filed, your contract cannot be approved until it is filed.

On September 1, 2015, §2252.908 of the Texas Government Code became effective. §2251.908 provides that on and after January 1, 2016, a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency. This disclosure requirement applies to contracts with a governmental entity or state agency that either: (1) require an action or vote by the governing body of the entity or agency before the contract may be signed; or, (2) has a value of at least \$1million.

The procedure for complying with this new law is as follows: (1) use the application on the Texas Ethics Commission's website (www.ethics.state.tx.us) to enter the required information to be included on Form 1295; (2) print a copy of Form 1295 and the separate certification of filing that contains a unique certification number; (3) sign the printed copy of Form 1295 and have your signature notarized; (4) file the completed Form 1295 and certification of filing with the governmental entity or state agency with which you are entering into the contract. The governmental entity or state agency then notifies the Texas Ethics Commission of receipt of the Form 1295 and the Texas Ethics Commission then will post the completed Form 1295 on its website for all to see.

CERTIFICATE OF INTERESTED PARTIES**FORM 1295**

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address: _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

CITY OF BEAUMONT
PINE STREET SWTP POLYMER SYSTEM AND CHEMICAL
STORAGE TANK IMPROVEMENTS
BID NO. WU0122-12

House Bill 89 (HB89) Verification

I, _____, the undersigned representative of _____, (Company or Business Name) (hereafter referred to as “Company”), being an adult over the age of eighteen (18) years of age, verify that the company named-above, under the provisions of Subtitle F, Title 10, Government Code Chapter 2270:

- 1. Does not boycott Israel currently; and
- 2. Will not boycott Israel during the term of the contract the above-named Company, business or individual with the City of Beaumont, Texas.

Pursuant to Section 2270.001, Texas Government Code:

- 1. “Boycott Israel” means refusing to deal with, terminating business activities with, or otherwise taking any action that *is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and*
- 2. “Company” means *a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or any limited liability company, including a wholly- owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business associations that exist to make a profit.*

DATE

SIGNATURE OF COMPANY

REPRESENTATIVE ON THIS THE _____ day of _____, 20_____, personally appeared _____, the above-named person, who after by me being duly sworn, did swear and confirm that the above is true and correct.

NOTARY SEAL

NOTARY SIGNATURE

Senate Bill 252 Ch. 2252 Certification

Pursuant to Texas Government Code, Chapter 2252, Section 2252.152 and Section 2252.153, certify that the company named above is not listed on the website of the Comptroller of the State of Texas concerning the listing of companies that are identified under Section 806.051, Section 807.051 or Section 2252.153. I further certify that should the above-named company enter into a contract that is on said listing of companies on the website to the Comptroller of the State of Texas which do business with Iran, Sudan or any foreign terrorist organization, I will immediately notify the City of Beaumont’s Purchasing Department.

Date Signed

Signature of Company Representative

Name in Printed Form

[THIS FORM MUST BE RETURNED WITH YOUR BID]

**PINE STREET SWTP POLYMER SYSTEM AND CHEMICAL STORAGE TANK
IMPROVEMENTS
BID NO. WU0122-12**

Texas Ethics Commission Certificate Number

HB 1295 -- Section 2252.098 of the Government Code states “a contract that requires an action or vote by the governing body of the entity or agency, or the value of the contract is at least one million dollars (\$1,000,000), must provide a Disclosure of Interested Parties Form on the Texas Ethics Commission website”.

Within fourteen (14) Calendar days after the award of contract by Beaumont City Council, the awarded vendor must complete the information requested on the Texas Ethics Commission website and provide the certificate number to the Water Utilities Department. The Texas Ethics Commission website is:

www.ethics.state.tx.us

At the home page, click on Form 1295 Filing Application, and follow the instructions. **Upon completion of the information on the website, provide the completed form and certificate number to the following Water Utilities – email addresses:**

Terry.Welch@beaumonttexas.gov
John.Pippins@beaumonttexas.gov
Dara.woodruff@beaumonttexas.gov

I understand the requirement as stated above and will comply within fourteen (14) calendar days after the award of contract by Beaumont City Council.

Signature

Company Name

Printed Name

Date Signed

Title

[THIS FORM MUST BE RETURNED WITH YOUR BID]

00 21 14 REQUIRED FORMS CHECKLIST

ARTICLE 1 – REQUIRED FORMS CHECKLIST

1.01 The following is a list of forms that shall be completed and submitted with bid:

TITLE	INITIALS
1. Section 00 21 14 Required Forms Checklist	_____
2. Texas Ethics Commission Certificate (end of Section 00 21 13 Instructions to Offerors)	_____
3. House Bill 89 (HB89) Verification Form (end of Section 00 21 13 Instructions to Offerors)	_____
4. Section 00 41 13 Bid Form	_____
5. Section 00 41 16 Bid Form Exhibit A	_____
6. Section 00 41 17 Bid Summary	_____
7. Section 00 43 16 Bid Bond	_____
8. Section 00 45 02 Non-Collusion Certification	_____
9. Section 00 45 03 Conflict of Interest Questionnaire	_____
10. Section 00 45 13 Qualifications Statement	_____
11. Section 00 73 16.1 Insurance Requirement Affidavit	_____
12. Section 00 73 16.2 Certificate of Insurance (Form No. COB1)	_____
13. Section 00 73 17 Texas Workers' Compensation Insurance	_____
14. Section 00 73 47 Statement of City Charter	_____
15. Section 00 73 48 Corporate Resolution	_____
16. Section 00 73 49.1 Local Bidder Consideration Claim Form	_____
17. Section 00 73 50.1 Minority Business Participation Schedule	_____
18. Section 00 73 51 Certificate of Interested Parties Information	_____

Each form listed must be completed and submitted with the bid. The person preparing the bid is to initial next to each form listed in the blank space provided to confirm that the corresponding form was filled out and submitted as part of the bid package. **DO NOT STAPLE BID DOCUMENTS BEING SUBMITTED.**

I, _____, verify that all required forms were submitted with the bid package.

Signature

Date

**NOTE: OMISSION OF ANY OF THE ABOVE FORMS
MAY RESULT IN THE CITY REJECTING BID.**

END OF SECTION

00 41 13 BID FORM

ARTICLE 1 – BID RECIPIENT

- 1.01 Offeror submits this Bid to:

City of Beaumont
City Hall, City Clerk's Office
801 Main Street, Suite 125
Beaumont, TX 77701
Attention: Tina Broussard, TRMC – City Clerk
Pine Street SWTP Polymer System and Chemical Storage Tank Improvements
Bid No. WU0122-12

ARTICLE 2 – OFFEROR'S ACKNOWLEDGMENTS

- 2.01 Offeror proposes and agrees, if this Bid is accepted, to enter into an Agreement with the Owner on the form included in the Contract Documents and to perform all Work specified or indicated in Contract Documents for the Contract Price indicated in this Bid or as modified by Contract Amendment. Offeror agrees to complete the Work within the Contract Times established in the Agreement or as modified by Contract Amendment and comply with the all other terms and conditions of the Contract Documents.
- 2.02 Offeror accepts all of the terms and conditions of Section 00 11 16 "Invitation to Bid" and Section 00 21 13 "Instructions to Offerors."
- 2.03 Offeror accepts the provisions of the Agreement as to liquidated damages in the event of its failure to complete Work in accordance with the schedule set forth in the Agreement.
- 2.04 Offeror acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date	Signature Acknowledging Receipt

ARTICLE 3 – OFFEROR'S REPRESENTATIONS

- 3.01 Offeror has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- 3.02 Offeror has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- 3.03 Offeror is familiar with Laws and Regulations that may affect cost, progress, and performance of the Work.

- 3.04 Offeror has carefully studied the following Site-related reports and drawings as identified in the Supplementary Conditions:
- A. Drawings of physical conditions relating to existing surface or subsurface structures at the Site;
 - B. Underground Facilities referenced in reports and drawings;
 - C. Reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site; and
 - D. Technical Data related to each of these reports and drawings.
- 3.05 Offeror has considered the:
- A. Information known to the Offeror;
 - B. Information commonly known to contractors doing business in the locality of the Site;
 - C. Information and observations obtained from visits to the Site; and
 - D. The Contract Documents.
- 3.06 Offeror has considered the items identified in Paragraphs 3.04 and 3.05 with respect to the effect of such information, observations, and documents on:
- A. The cost, progress, and performance of the Work;
 - B. The means, methods, techniques, sequences, and procedures of construction to be employed by Offeror; and
 - C. Offeror's safety precautions and programs.
- 3.07 Offeror agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents based on the information and observations referred to in the preceding paragraphs.
- 3.08 Offeror is aware of the general nature of Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- 3.09 Offeror has correlated the information known to the Offeror, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- 3.10 Offeror has given the Construction Manager written notice of all conflicts, errors, ambiguities, or discrepancies that the Offeror has discovered in the Contract Documents, and the written resolution provided by the Construction Manager is acceptable to the Offeror.
- 3.11 The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- 3.12 Offeror's submittal of a Bid constitutes an incontrovertible representation that, without exception, all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 4 – BASIS OF OFFER

- 4.01 Offeror will complete the Work in accordance with the Contract Documents at the unit prices shown in the attached in Section 00 41 16 “Bid Form Exhibit A”:
- A. Extended amounts have been computed in accordance with the General Conditions.
 - B. Offeror acknowledges that the estimated quantities are not guaranteed, and final payment for all unit price items will be based on actual quantities provided, measured as provided in the Contract Documents.
 - C. Unit prices will be used to compute the actual Bid price.

ARTICLE 5 – TIME OF COMPLETION

- 5.01 Offeror agrees that the Work will be Substantially Complete and will be completed and ready for final payment in accordance with the General Conditions within the number of calendar days indicated in Section 00 41 16 “Bid Form Exhibit A.”

ARTICLE 6 – ATTACHMENTS TO THIS BID

- 6.01 The following documents are attached to and made a condition of this Bid:
- A. Section 00 41 16 “Bid Form Exhibit A.”
 - B. Section 00 43 13 “Bid Bond.”
 - C. Section 00 45 01 “Nonresident Bidders.”
 - D. Section 00 45 02 “Non-Collusion Certification.”
 - E. Section 00 45 03 “Conflict of Interest Questionnaire.”
 - F. Section 00 45 04 “State Sales Tax Requirements.”

ARTICLE 7 – VENUE

- 7.01 Offeror agrees that venue will lie exclusively in Jefferson County, Texas for any legal action.

ARTICLE 8 – BID DELIVERY

8.01 This Bid is offered by:

Offeror: _____
(typed or printed name of organization)

Signature: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

Phone: _____ Email: _____

(Attach evidence of authority to sign if Offeror is a corporation, partnership, or a joint venture.)

END OF SECTION

00 41 16 Bid Form Exhibit A

Project:	Pine Street SWTP Polymer System and Chemical Storage Tank Improvements		Project No.:
Owner:	City of Beaumont		BMT21704
Engineer:	Freese and Nichols, Inc.		Bid No. WU0122-12
Offeror:			

Base Bid					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Extended Amount
Items in Base Bid (excluding Allowances) per Section 01 29 01 "Measurement and Basis for Payment"					
A-01	Mobilization	1	LS		
A-02	Storm Water Pollution Prevention Plan	1	LS		
A-03	Trench Safety	1	LS		
A-04	Structural Modifications to Bulk Chemical Storage Facility including excavation, backfill/site preparation, new concrete storage bays, ladders, sumps, and tank pads in accordance with the Contract Documents and complete in place.	1	LS		
A-05	Miscellaneous Improvements at Bulk Chemical Storage Facility including demolition of existing sodium chlorite piping, disposal of chemical, relocation of sodium chlorite tank, demolition of existing emergency eyewash/showers and piping, addition of new emergency eyewash/showers and piping, lighting and new duct bank in accordance with the Contract Documents and complete in place.	1	LS		
A-06	Caustic System Improvements at Bulk Chemical Storage Facility including demolition of existing caustic tanks and associated piping, new chemical storage tanks with heat tracing, sump pumps, electrical and instrumentation, chemical piping, valves, and appurtenances in accordance with the Contract Documents and complete in place.	1	LS		
A-07	Alum System Improvements at Bulk Chemical Storage Facility including new chemical storage tank, sump pump, electrical and instrumentation, chemical piping, valves, and appurtenances in accordance with the Contract Documents and complete in place.	1	LS		

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Extended Amount
A-08	Improvements to Ammonia Storage at Chemical Feed Building including demolition and replacement of ammonia day tank, and associated piping, valves, and appurtenances in accordance with the Contract Documents and complete in place.	1	LS		
A-09	Improvements to Polymer System at Chemical Feed Building including demolition of storage drums and scales, and associated piping, addition of a polymer storage tank, peristaltic pumps, flow meters, and associated valves, piping, flexible tubing, instrumentation, and appurtenances in accordance with the Contract Documents and complete in place.	1	LS		
A-10	Chemical Feed Building Ramp Modifications including concrete ramp in accordance with the Contract Documents and complete in place.	1	LS		
A-11	Owner Directed Items	1	LS	\$ 150,000.00	\$ 150,000.00
A	Total Base Bid Items Amount (Sum of Extended Amounts for each Base Bid Line Item)				
B	Add (+) or Deduct (-) (See Note 1)				
C	Total Adjusted Base Bid Amount (Sum of A and B)				

Contract Time

F	Offeror agrees to reach Substantial Completion in	210	days
G	Offeror agrees to reach Final Completion in	270	days

Notes	
1	Provision is made for Offeror to include an addition or deduction in the Bid to reflect any last minute adjustments in price. The addition or deduction, if made, will be applied proportionately to the bid items as applicable.

BID SUBMITTED BY:	
Offeror:	_____
Signature:	_____
Printed Name:	_____
Title:	_____
Date:	_____

00 43 13 BID BOND

Offeror as Principal Name: Mailing address (principal place of business): 	Surety Name: Mailing address (principal place of business):
Owner Name: Mailing address (principal place of business): 	Physical address (principal place of business): Telephone (Main): Telephone (Claims):
Contract Project name and number: Bid/Proposal Due Date: 	Surety's state of incorporation: <i>By submitting this bond, Surety affirms it is authorized to do business and licensed to execute bonds in Texas.</i> Local Agent for Surety Name: Company: Mailing address (principal place of business): Telephone (Main):
Bond Contract Price Offered: Penal Sum of Bond: 5% of Contract Price offered Date of Bond: 	

Surety and Offeror, intending to be legally bound by this bond, do each cause this bond to be duly executed on its behalf by its authorized officer, agent, or representative. The Offeror and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally to this bond. The condition of this obligation is such that if Owner accepts Offeror's Bid or Proposal and Offeror delivers the executed Agreement and the required bonds and evidence of insurance within the time stipulated in the Bidding or Proposal Documents this obligation is null and void. Payment under this bond will be due and payable upon default by Offeror and within 30 calendar days after receipt by Offeror and Surety of written notice of default from Owner. Venue lies exclusively in Jefferson County, Texas for any legal action.

Offeror as Principal Signature: _____ Name: _____ Title: _____ Email: _____	Surety Signature: _____ Name: _____ Title: _____ Email: _____ (Attach Power of Attorney)
--	--

END OF SECTION

00 45 02 NON-COLLUSION CERTIFICATION

By submission of this proposal, the Offeror _____
certifies that (s)he is _____ of _____
under penalty of perjury, affirms:

1. The prices in this proposal have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Offeror or with any competitor;
2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the Offeror and will not knowingly be disclosed by the Offeror prior to opening, directly or indirectly, to any other Offeror or to any competitor; and
3. No attempt has been made or will be made by the Offeror to induce any other person, partnership or corporation to submit or not submit a proposal for the purpose of restricting competition.
4. The proposal was not made in the interest of or on behalf of any undisclosed person, partnership, company, organization or corporation.
5. Each person signing the proposal certifies that:
 - a. He is the person in the Consultant's organization responsible within that organization for the decision as to prices being offered in the proposal and that he has not participated and will not participate in any action contrary to (1-4] above; or
 - b. He is not the person in the Consultant's organization responsible within that organization for the decision as to prices being offered in the proposal but that he has been authorized in writing to act as agent for the persons responsible for such decisions in certifying that such persons have not participated, and will not participate, in any action contrary to (1-4) above, and that as their agent, does hereby so certify; and that he has not participated, and will not participate in any action contrary to (1- 4) above.

END OF SECTION

CONFLICT OF INTEREST QUESTIONNAIRE For vendor doing business with local governmental entity		FORM CIQ
<p>This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.</p> <p>This questionnaire is being filed in accordance with Chapter 176 of the Local Government Code by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).</p> <p>By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.</p> <p>A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.</p>	OFFICE USE ONLY <div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div> Name of vendor who has a business relationship with local governmental entity. <div style="border: 1px solid black; height: 30px; width: 100%;"></div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div> <div style="display: inline-block; vertical-align: middle;"> <input type="checkbox"/> </div> Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">3</div> Name of local government officer about whom the information is being disclosed. <div style="border: 1px solid black; height: 30px; width: 100%;"></div> <div style="text-align: center; margin-top: 5px;">Name of Officer</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div> Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary. <p>A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?</p> <p style="margin-left: 40px;"> <input type="checkbox"/> Yes <input type="checkbox"/> No </p> <p>B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?</p> <p style="margin-left: 40px;"> <input type="checkbox"/> Yes <input type="checkbox"/> No </p>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">5</div> Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more. <div style="border: 1px solid black; height: 80px; width: 100%;"></div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">6</div> <div style="display: inline-block; vertical-align: middle;"> <input type="checkbox"/> </div> Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1) <div style="border: 1px solid black; height: 30px; width: 100%;"></div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">7</div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 60%; border-top: 1px solid black; text-align: center;"> Signature of vendor doing business with the governmental entity </div> <div style="width: 35%; border-top: 1px solid black; text-align: center;"> Date </div> </div>		

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

- (1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);
- (2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or
- (3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

- (A) begins discussions or negotiations to enter into a contract with the local governmental entity; or
- (B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

- (A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);
- (B) that the vendor has given one or more gifts described by Subsection (a); or
- (C) of a family relationship with a local government officer.

END OF SECTION

00 45 04 STATE SALES TAX REQUIREMENTS

Comply with all applicable sales, excise, and use tax requirements of the Texas Tax Code. The Offeror hereby certifies that the Contract Price is divided as follows:

Tax exempt products, materials, and services (See Notes 1 and 2)	\$	_____
Taxable products, materials, and services (See Note 3)	\$	_____
Total (See Note 4)	\$	_____

Offeror: _____
(typed or printed name of organization)

Signature: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Business Address: _____

Phone: _____ Email: _____

(Attach evidence of authority to sign if Offeror is a corporation, partnership, or a joint venture.)

Notes:

1. Exempt products and materials are those items purchased for the Project which are physically incorporated into the facilities constructed for the Owner or are necessary and essential for the performance of the Work and are completely consumed at the Site. For purposes of this definition, products and materials are completely consumed if after being used once for its intended purpose it is used up or destroyed. Products and materials rented or leased for use in the performance of the Work cannot be completely consumed for the purposes of this definition.
2. Exempt services are those services performed at the Site where the Contract expressly requires the specific service to be provided or purchased by the person performing the Work or the service is integral to the performance of the Work.
3. Products, materials, and services are not tax exempt if they are used by the Contractor but are not physically incorporated into the Owner's facilities or are not consumed by construction as defined above. Machinery or equipment and its accessories and repair and replacement parts used in the performance of the Work are not exempt.
4. The total sum of the amount for tax exempt and taxable products, materials, and services must equal the Contract Price.

END OF SECTION

00 45 13 QUALIFICATIONS STATEMENT

ARTICLE 1 – REQUIREMENTS FOR THE QUALIFICATIONS STATEMENT

- 1.01 The Qualifications Statement must be submitted by the apparent low Offeror with the bid and include the information as described in this Section as a minimum. Failure to submit the required information in the Qualifications Statement may result in the Owner considering the Bid non-responsive and may result in rejection of the Bid by the Owner. Offerors may be required to provide supplemental information if requested by the Owner to clarify, enhance, or supplement the information provided in the Qualifications Statement.
- 1.02 Offerors must provide the information requested in this Qualifications Statement using the forms attached to this Section. These forms are available in Microsoft Word or Excel on the procurement website. The information requested in these forms must be provided completely and in detail. Information that cannot be totally incorporated in the forms may be included as an appendix to the form. This appendix must be clearly referenced by appendix number on the form, and the appended material must include the appendix number on every sheet of the appendix. The appendix must include only the information that responds to the question or item number to which the appended information applies.
- 1.03 Offerors may provide supplemental information to the Qualifications Statement such as organizational brochures or other marketing information to help demonstrate their qualifications to the Owner. This information may not be submitted as a substitute for the information specifically requested in this Section. The reference must include the specific paragraph or section that applies to that question or item if this information is included as an appendix to the information requested in Article 2.

ARTICLE 2 – INSTRUCTIONS FOR PREPARING THE QUALIFICATIONS STATEMENT

- 2.01 Offeror's Organization and General Information:
 - A. Provide general information about the Offeror's organization using copies of Table 1. Provide the same information for each joint venture partner if the Offeror is a joint venture.
 - B. Provide information regarding the operational structure of the Offeror's organization, including a list of officers, the limits of authority for these individuals with regards to the proposed Project, documentation of authority to execute documents, and a copy of organizations' certificate of authorization to conduct business in the state the Project is located in. If the Project is located in a state that licenses contractors, Offeror must also provide documentation showing that the organization is licensed as a general contractor in that state, including any applicable classifications and limitations.
 - C. Financial Management:
 1. Provide Offeror's most recent audited financial statement and the most recent financial statement if the most recent audited financial statement is more than 2 years old.

2. Provide the Offeror's financial summary information in Table 1, including the financial indicators from the Offeror's most recent financial statement using the formulas below:

Current Ratio: $\text{Current Assets} \div \text{Current Liabilities}$

Quick Ratio: $(\text{Cash and Cash Equivalents} + \text{Accounts Receivable} + \text{Short Term Investments}) \div \text{Current Liabilities}$

3. Describe the resources that are available to the Offeror to provide adequate cash flow for the Project if Offeror's Current Ratio or Quick Ratio are less than 1.0.

D. Safety:

1. Provide a narrative not to exceed four pages describing the Offeror's success in implementing an effective project site safety program. Provide a narrative describing the Offeror's safety program and a statement regarding the organization's commitment to safety. Offerors should not provide copies of safety manuals or programs.
 2. Provide Experience Modification Ratio (EMR) and Total Recordable Frequency Rate (TRFR) history for the last 3 years for the Offeror and any proposed Subcontractors that will provide Work valued at 25 percent or more of the Contract Price. Provide this information in Table 1.
 - a. The Offeror's EMR is a computation by the insurance industry that compares a company's annual losses in workers' compensation insurance claims against its policy premiums over a three-year period, excluding the current year.
 - b. The Offeror's TRFR is a calculation of a firm's total number of OSHA-recordable injuries and illnesses over a given period (usually a year), divided by the total number of personnel-hours worked.
- E. Claims Experience and Litigation History: Provide a list of all claims or litigation involving owners on other construction projects that have been active over the last 5 years or that are currently unresolved. Include this information in Table 1. Provide a narrative describing the issues being contested and when it is anticipated that the disputes will be resolved. Claims are to include only those items which have progressed through the change management process for the project and are being disputed by the Offeror or the project owner.
- F. Past Experience with the Owner: Provide a list of projects that have been completed with the Owner over the last 5 years. Include this information in Table 1. Provide a narrative not to exceed two pages describing how this experience will impact the performance of the Offeror on this Project.

2.02 Project Experience:

- A. Provide a list of up to 10 projects completed by the Offeror in the last 5 years using copies of Table 2.
- B. Provide detailed descriptions of projects which demonstrate the experience of the Offeror's team with construction of similar projects. Experience must include, as a minimum, the satisfactory completion of at least 5 similar projects within the last 10 years. Offerors not

meeting the requirement for similar projects may be disqualified as being non-responsive. Similar projects include:

1. Chemical system improvements, plant electrical improvements, and plant civil work.
- C. Provide a narrative not to exceed two pages for each project describing up to five specific projects that qualify as similar projects. Projects selected must demonstrate the capabilities of the Offeror.

2.03 Experience and Qualifications of Proposed Key Personnel:

- A. Provide a narrative not to exceed four pages describing the Offeror's project management structure and the qualifications of the project management team for this Project. Include an organization chart showing the relationship between Offeror and key Subcontractors and Suppliers.
- B. Provide information on the key personnel proposed for this Project on Tables 3 through 7. Key personnel include the project manager, project superintendent, safety manager, and quality control manager. The Offeror may provide information on an alternate individual if the Offeror is not able to commit to one individual for the Project at the time the Bid is submitted. Qualifications of these individuals will be considered in evaluating the qualifications of the Offeror. The Offeror must commit to providing the services of the proposed key personnel or alternate for the life of the Project as a condition of qualification. Failure to provide the proposed key personnel may result in the disqualification of the Offeror and will provide the basis for termination of the Contract at the discretion of the Owner.
- C. Include a list of the current project assignments for each of the individuals proposed, the anticipated completion date for this assignment, and the percentage of the time they will have available to devote to this Project. The Project Superintendent must be dedicated to this Project full time for the duration of the Project. If any other key personnel are not devoted solely to this Project, indicate how time is to be divided between this Project and their other assignments. Specifically address how and when individuals currently on other assignments will transition into this Project.
- D. Provide resumes not exceeding two pages for each individual proposed for the key personnel positions and their alternates. Resumes must describe the qualifications of the individual and include the following as a minimum: technical experience, managerial experience, education and formal training, primary language, and a work history which describes project experience, including the roles and responsibilities for each assignment. Additional information highlighting the experience which makes them the best candidate for the assignment should also be included. Focus on projects on which individuals proposed have had significant involvement in the last 5 years and which demonstrate their experience with similar projects.
- E. Identify individuals that will fill one or more of these key roles and describe their ability to handle multiple responsibilities. Provide a written narrative describing the percentage of the time that will be devoted to each role and the qualifications to fulfill each role if an individual is to fulfill more than one of the key personnel roles.
- F. Provide a tabulation of the projects on which the key personnel have been personally involved using copies of Table 7. This tabulation is to include the name and a current telephone number for references for each of these project assignments.

- G. Provide a narrative not to exceed two pages for each project the proposed individuals have worked on that qualify as similar projects. Specifically identify the role and responsibilities of the individual on these similar projects. Projects selected must demonstrate the capabilities of the proposed key personnel.
 - H. Provide a narrative not to exceed ten pages to describe the overall performance of the individuals on these projects. This narrative may include references to letters of recommendation, project awards, and other references to demonstrate experience in constructing a project which meets the owner's expectations for a quality project constructed on time and within budget.
- 2.04 Offeror's Ability to Complete Projects within the Contract Price and Contract Times:
- A. Provide a tabulation of budget performance on projects completed by the Offeror within the last 5 years using copies of Table 8 to demonstrate the ability of the Offeror to complete projects for the Contract Price. Notes may be added to each line item to describe circumstances for change orders beyond the control of the Offeror.
 - B. Provide a tabulation of all projects completed by the Offeror within the last 5 years on Table 9 to demonstrate performance in completing projects on time. Notes may be added to the tabulations to indicate the reasons for not meeting original contract completion dates.

ARTICLE 3 – BID REQUIREMENTS

- 3.01 Provide the Qualifications Statement using the referenced tables and narrative descriptions as described in this Section. Pages are to be 8-1/2 x 11 pages using a minimum font size of 10. Provide a tab to separate materials responding to each of the rating categories listed in Article 2.
- 3.02 Additional information may be included in appendices attached to the Bid. Each appendix must reference the section of the criteria if is in reference to.
- 3.03 Provide one printed copy of the Bid at the time and place set forth in Section 00 11 16 "Invitation to Bid." Provide a digital copy of the Bid in Portable Document Format (pdf) on a CD. This digital copy is to include all information required to evaluate the Bid.

ARTICLE 4 – FORMS

- 4.01 The following tables are attached to this Section:

Table	Description
1	General Information
2	Current Projects and Project Completed within the last <u>10</u> Years
3	Proposed Project Managers
4	Proposed Project Superintendents
5	Proposed Project Safety Managers
6	Proposed Project Quality Control Managers
7	Project Information for Key Personnel
8	Demonstration of Budget Performance
9	Demonstration of On-Time Performance

ARTICLE 5 – CERTIFICATION

- 5.01 By submitting this Qualifications Statement and related information, Offeror certifies that it has read this Qualifications Statement and that Offeror's responses are true and correct and contain no material misrepresentations, and that the individual signing below is authorized to make this certification on behalf of the Offeror's organization.

Offeror: _____
(typed or printed name of organization)

Signature: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Designated Representative:

Name: _____

Title: _____

Address for giving notices:

Phone: _____ Email: _____

(Attach evidence of authority to sign if Offeror is a corporation, partnership, or a joint venture.)

Table 1 - General Information

Organization			
Legal Name of Business			
Form of Business Entity: <input type="checkbox"/> Joint Venture <input type="checkbox"/> Corporation <input type="checkbox"/> General Partnership <input type="checkbox"/> Limited Partnership			
Date Business was formed		State under which Business was formed	
Is this Business authorized to operate in the Project location: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Pending			
Is this Business licensed as a general contractor in the Project location: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Pending <input type="checkbox"/> N/A			
List of companies, firms, or organizations that own any part of this Business.			
Name of company, firm, or organization.			Percent ownership
Principal Office			
Primary contact		Main telephone number	
Email address		Website address	
Business address of principal office			
Regional Office			
Primary contact		Main telephone number	
Email address		Website address	
Business address of regional office			
Business History			
List of names that this Business currently has or anticipates operating under over the history of the Business, including the names of related companies presently doing business.			
Names of organization		From date	To date
Indicators of Organization Size			
Average number of current full-time employees			
Average estimate of revenue for the current year			

Table 1 - General Information Cont'd

Previous Contracting Experience			
Years of experience in projects similar to the proposed Project:			
As a general contractor		As a joint venture partner	
Has this organization or a participating or predecessor organization ever been disqualified as a bidder by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Has this organization or a participating or predecessor organization ever been barred from contracting by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Has this organization or a participating or predecessor organization been released from a bid or proposal in the past 5 years? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Has this organization or a participating or predecessor organization ever defaulted on a project or failed to complete any contract awarded to it? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Has this organization or a participating or predecessor organization ever refused to construct or refused to provide materials defined in the contract documents or in a change order? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Is this organization or a participating or predecessor organization currently involved in any litigation or contemplating litigation? <input type="checkbox"/> Yes* <input type="checkbox"/> No			
Provide full details in a separate attachment for each statement above with a "yes" response above.			
Previous History with Owner			
List projects that have been completed with the Owner over the last 5 years. If more than 5 projects, list only the most recent.			
	Project Name		Year
1			
2			
3			
4			
5			
Previous Claims History and Litigation Experience			
List all claims or litigation involving owners on other construction projects that have been active over the last 5 years or that are currently unresolved.			
	Description of Claim or Litigation		Status
1			
2			
3			
4			
5			

Table 1 - General Information Cont'd

Surety								
Surety Name								
Mailing address (principal place of business):					Physical address (principal place of business):			
Telephone (main number)					Telephone (claims notices)			
Name of Local Agent for Surety								
Telephone				Email				
Surety is a corporation organized and existing under the laws of the state of								
Is surety authorized to provide surety bonds in the Project location? <input type="checkbox"/> Yes <input type="checkbox"/> No								
Is surety listed in the U.S. Department of the Treasury's Listing of Approved Sureties (Department Circular 570 "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies")? <input type="checkbox"/> Yes <input type="checkbox"/> No								
Insurance								
Name of Insurance Provider								
Provider is a corporation organized and existing under the laws of the state of								
Is Provider licensed or authorized to issue insurance policies in the Project location?							<input type="checkbox"/> Yes <input type="checkbox"/> No	
Does Provider have an A.M. Best Rating of A-VIII or Better?							<input type="checkbox"/> Yes <input type="checkbox"/> No	
Mailing Address (principal place of business)								
Physical Address(principal place of business)								
Telephone (main number)								
Telephone (for notice of claims)								
Local Agent for Provider								
Address for Local Agent								
Telephone for Local Agent								
Construction Site Safety Experience								
Provide Offeror's Experience Modification Ratio (EMR) and Total Recordable Frequency Rate (TRFR) for the last 3 years and the EMR and TRFR history for the last 3 years of any proposed Subcontractor that will provide Work valued at 25% or more of the Contract Price.								
Year	Offeror		Subcontractor		Subcontractor		Subcontractor	
	EMR	TRFR	EMR	TRFR	EMR	TRFR	EMR	TRFR
1								
2								
3								

Table 1 - General Information Cont'd

Financial Summary Information for Offeror		
Date of Offeror's most current financial statement		
Date of Offeror's most current audited financial statement		
Financial indicators from the most current financial statement:		
Offeror's Current Ratio = Current Assets ÷ Current Liabilities		
Offeror's Quick Ratio = (Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities		
Describe the resources that are available to the Offeror to provide adequate cash flow for the Project if Offeror's Current Ratio or Quick Ratio are less than 1.0:		
Disadvantaged Business Certifications		
Name of Certification	Certifying Agency	Certification Date
<input type="checkbox"/> Disadvantage Business Enterprise		
<input type="checkbox"/> Minority Business Enterprise		
<input type="checkbox"/> Woman Business Enterprise		
<input type="checkbox"/> Disabled Veteran Owned Business		
<input type="checkbox"/> Historically Underutilized Business		
<input type="checkbox"/> Small Business Enterprise		
<input type="checkbox"/> Other		
<input type="checkbox"/> None		

Table 2 - Current Projects and Project Completed within the last 10 Years

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Table 3 - Proposed Project Managers

Name of Organization			
Primary Candidate			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	
Alternate Candidate			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	

Table 4 - Proposed Project Superintendents

Name of Organization			
Primary Candidate			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	
Alternate Candidate			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	

Table 5 - Proposed Project Safety Managers

Name of Organization			
Primary Candidate			
Name of individual			
Years of experience as project safety manager			
Years of experience with this organization			
Number of similar projects as project safety manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	
Alternate Candidate			
Name of individual			
Years of experience as project safety manager			
Years of experience with this organization			
Number of similar projects as project safety manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	

Table 6 - Proposed Project Quality Control Managers

Name of Organization			
Primary Candidate			
Name of individual			
Years of experience as quality control manager			
Years of experience with this organization			
Number of similar projects as quality control manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	
Alternate Candidate			
Name of individual			
Years of experience as quality control manager			
Years of experience with this organization			
Number of similar projects as quality control manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment	Percent of time used for this project	Estimated project completion date	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Role on project		Role on project	

Table 7 - Project Information for Key Personnel

Name of Organization											
Provide information on all projects completed by the Organization within the last 5 years.											
Project Owner					Project Name						
General Description of Project											
Project Budget and Schedule Performance											
Budget History	Amount		% of Bid Amount	Schedule Performance			Date		Days		
Original Contract Price				Notice to Proceed							
Change Orders				Contract Substantial Completion Date at Notice to Proceed							
Owner Enhancements				Contract Final Completion Date at Notice to Proceed							
Unforeseen Conditions				Change Order Authorized Substantial Completion Date							
Design Issues				Change Order Authorized Final Completion Date							
Total				Actual / Estimated Substantial Completion Date							
Final Cost				Actual / Estimated Final Completion Date							
Key Project Personnel											
			Project Manager		Project Superintendent		Safety Manager		Quality Control Manager		
Name											
Percentage of time devoted to the project											
Percentage of time proposed for this Project											
Did Individual start and complete the project?											
If not, who started or completed the project in their place?											
Reason for change?											
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)											
	Name		Title/Position		Organization		Telephone		Email		
Owner											
Designer											
Construction Manager											
Surety											
Issues / disputes resolved or pending resolution by arbitration, litigation or dispute review boards											
Number of issues resolved		Total amount involved in resolved issues		Number of issues pending		Total amount involved in issues pending					

Table 8 - Demonstration of Budget Performance

Name of Offeror							
Provide information on all projects completed by the Offeror within the last 5 years.							
Owner Name	Project Description	Original Contract Price	Value of Change Orders			Total Change Orders	Percent of Changes to Original Contract Price
			Owner Enhancements	Unforeseen Conditions	Design Issues		
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							
Notes:							

Table 9 - Demonstration of On-Time Performance

[illegible]

END OF SECTION

00 52 13 AGREEMENT

This Agreement is between the City of Beaumont (Owner) and **[name of Contractor to be inserted at time of Contract execution]** (Contractor).

Owner and Contractor agree as follows:

ARTICLE 1 – WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is designated as follows:

Pine Street SWTP Polymer System and Chemical Storage Tank Improvements
Bid No. WU0122-12

ARTICLE 2 – DESIGN PROFESSIONAL

- 2.01 The Design Professional for this Project is:

Freese and Nichols, Inc.
Somnath Chilukuri, P.E.
11200 Broadway St., Ste. 2320
Pearland, TX 77584

ARTICLE 3 – CONSTRUCTION MANAGER

- 3.01 The Construction Manager for this Project is:

Freese and Nichols, Inc.
11200 Broadway St., Ste. 2320
Pearland, TX 77584

ARTICLE 4 – CONTRACT TIMES

- 4.01 Contract Times

- A. The Work is required to be substantially complete within 270 days after the date when the Contract Times commence to run as provided in the General Conditions and complete and ready for final payment in accordance with the General Conditions within 60 days after the date of Substantial Completion.
- B. Milestones, the dates for completion of each, and associated liquidated damages are as defined in Section 01 35 00 "Special Procedures."
- C. Critical Operations, maximum time out of service, and associated liquidated damages are as defined in Section 01 35 00 "Special Procedures."

- 4.02 Liquidated Damages

- A. Owner and Contractor recognize that the Contract Times specified for Critical Operations, Substantial Completion and Final Completion are of the essence in the Contract. Owner and Contractor recognize that the Owner will suffer financial loss if the Work is not completed within the Contract Times specified in this Agreement and in Section 01 35 00 "Special

Procedures” as may be adjusted in accordance with the General Conditions. Owner and Contractor also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration preceding the actual loss suffered by Owner if the Work is not completed within the Contract Times. Accordingly, instead of requiring proof of the amount of these damages, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Contractor agrees to pay Owner \$700 for each day that expires after the time specified in this Agreement for Substantial Completion until the Work is substantially complete.
 2. Contractor agrees to pay Owner \$700 for each day that expires after the time specified in this Agreement for Final Completion until the Work is completed and ready for final payment in accordance with the General Conditions.
- B. Liquidated damages for failing to timely attain Substantial Completion and Final Completion are not additive and will not be imposed concurrently.
- C. Contractor agrees to pay the Owner liquidated damages as stipulated in Section 01 35 00 “Special Procedures” for failure to meet Contract Times for Milestones or Critical Operations.
- D. OPT will determine whether the Work has been completed within the Contract Times. Assessment of liquidated damages by the Owner does not waive the Owner’s right to assess or collect additional damages which the Owner may sustain by the failure of the Contractor to perform in accordance with the terms of the Contract.

4.03 Actual Damages

- A. Owner may be subject to additional financial losses as the result of failure to complete work within the specified Milestones described in Section 01 35 00 “Special Procedures.” These losses were not included in the liquidated damages amount established in this Agreement. Contractor will be required to compensate the Owner for these losses if they occur due to the Contractor’s failure to complete work within the specified Milestone Dates.

ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner will pay the Contractor the following amount for completion of the Work in accordance with the Contract Documents:

A	Lump Sum Base Bid Amount	\$
---	--------------------------	----

ARTICLE 6 – PAYMENT PROCEDURES

- 6.01 Submit Applications for Payment in accordance with the General Conditions. Applications for Payment will be processed by the Construction Manager per Section 01 29 00 “Application for Payment Procedures.”
- 6.02 Owner will make progress payments on or about the 1st day of each month during performance of the Work. Payment is based on the total earned value of Work completed in the previous month in accordance with the Schedule of Values established as provided in the General Conditions.

- 6.03 Payment will be made for the total earned value of Work completed in the previous month after deducting:
- A. Retainage calculated per this Agreement;
 - B. Set-offs determined in accordance with the General Conditions; and
 - C. The total amount of payments previously made.
- 6.04 Retainage
- A. Progress payments will be made in an amount equal to 95 percent of the total earned value to date for completed Work and properly stored materials. The remaining 5 percent of the total earned value to date will be held as retainage. Owner may increase retainage to 10 percent if progress on the Project is considered to be unsatisfactory. Owner will deposit retainage in excess of 5 percent in an interest-bearing account. Interest earned by that account will be paid to the Contractor in accordance with in accordance with Tex. Gov't Code Chapter 2252.
- 6.05 Release or reduction in retainage is contingent upon the consent of surety to the reduction in retainage. Submit a Consent of Surety Company to Reduction of or Partial Release of Retainage form as provided by or approved by the Construction Manager.
- 6.06 Owner will pay the remainder of the Contract Price as recommended by Construction Manager in accordance with the General Conditions upon Final Completion and acceptance of the Work.

ARTICLE 7 – PAYMENT OF INTEREST

- 7.01 No interest payments will be paid to the Contractor for invoices not paid when due as provided in the General Conditions.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 The Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied the following Site related reports and drawings as identified in the Supplementary Conditions:
 - 1. Geotechnical Data Reports regarding subsurface conditions at or adjacent to the Site;
 - 2. Drawings of physical conditions relating to existing surface or subsurface structures at the Site;
 - 3. Underground Facilities referenced in reports and drawings;
 - 4. Reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site; and

5. Technical Data related to each of these reports and drawings.
- E. Contractor has considered the:
 1. Information known to Contractor;
 2. Information commonly known to contractors doing business in the locality of the Site;
 3. Information and observations obtained from visits to the Site; and
 4. The Contract Documents.
- F. Contractor has considered the items identified in Paragraphs 8.01.D and 8.01.E with respect to the effect of such information, observations, and documents on:
 1. The cost, progress, and performance of the Work;
 2. The means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and
 3. Contractor's safety precautions and programs.
- G. Based on the information and observations referred to in the preceding paragraphs, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- H. Contractor is aware of the general nature of Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- I. Contractor has correlated the information known to the Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- J. Contractor has given the Construction Manager written notice of all conflicts, errors, ambiguities, or discrepancies that the Contractor has discovered in the Contract Documents, and the written resolution provided by the Construction Manager is acceptable to the Contractor.
- K. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- L. Contractor's entry into this Agreement constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – ACCOUNTING RECORDS

- 9.01 Accounting Record Availability: Contractor is to establish and maintain, in accordance with generally accepted accounting practices, full and detailed accounting records of materials incorporated into the Project, and labor, tools, materials, and equipment used for the Work, consistent with the requirements of the General Conditions and as necessary for proper financial management under this Agreement. Subject to prior written notice, provide Owner reasonable access during normal business hours to Contractor's records, books,

correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and the Contractor's fee. Preserve all such documents for a period of 3 years after the final payment by the Owner.

ARTICLE 10 – OTHER REQUIREMENTS

10.01 Workers' Compensation Insurance

- A. By signing this Agreement, Contractor certifies that it provides workers' compensation insurance coverage for all employees employed on this Project pursuant to Tex. Lab. Code Section 406.096(a).
- B. As required by Section 406.096(b), Contractor must require each Subcontractor to certify in writing to the Contractor that the Subcontractor provides workers' compensation insurance coverage for all of the employees it employs on this Project. Contractor must provide these certifications to the Owner within 10 days of the Effective Date of the Agreement.

10.02 Contracts Prohibited by Tex. Gov't Code Chapter 2155

- A. Section 2155.004:
 - 1. Section 2155.004 states that "a state agency may not accept a bid or award a contract that includes proposed financial participation by a person who received compensation from the agency to participate in preparing the specifications or request for proposals on which the bid or contract is based."
 - 2. Under Section 2155.004, Government Code, Contractor certifies that the individual or business entity named in this bid or contract is not ineligible to receive the specified Contract and acknowledges that this Contract may be terminated and payment withheld if this certification is inaccurate.
- B. Section 2155.006:
 - 1. Section 2155.006 states that "a state agency may not accept a bid or award a contract, including a contract for which purchasing authority is delegated to a state agency, that includes proposed financial participation by a person who, during the five-year period preceding the date of the bid or award, has been: (1) convicted of violating a federal law in connection with a contract awarded by the federal government for relief, recovery, or reconstruction efforts as a result of Hurricane Rita, as defined by Section 39.459, Utilities Code, Hurricane Katrina, or any other disaster occurring after September 24, 2005; or (2) assessed a penalty in a federal civil or administrative enforcement action in connection with a contract awarded by the federal government for relief, recovery, or reconstruction efforts as a result of Hurricane Rita, as defined by Section 39.459, Utilities Code, Hurricane Katrina, or any other disaster occurring after September 24, 2005.
 - 2. Under Section 2155.006, Government Code, Contractor certifies that the individual or business entity named in this bid or contract is not ineligible to receive the specified Contract and acknowledges that this Contract may be terminated and payment withheld if this certification is inaccurate.

- 10.03 Prohibition on Contracts with Companies Engaged in Business with Iran, Sudan, or Foreign Terrorist Organizations
- A. Tex. Gov't Code Chapter 2252, Subchapter F, prohibits the award of governmental contracts to companies engaged in business with Iran, Sudan, or foreign terrorist organizations.
 - B. By signing this Agreement, Contractor certifies that it is not ineligible to be awarded this Contract under Chapter 2252, Subchapter F.
- 10.04 Prohibition on Contracts with Certain Companies that Boycott Israel
- A. Tex. Gov't Code Chapter 2270 prohibits the award of governmental contracts to companies boycotting Israel.
 - B. By signing this Agreement, Contractor certifies that it does not boycott Israel and will not boycott Israel during the term of this Contract.
- 10.05 Certificate of Interested Parties: Contractor must complete and submit a Certificate of Interested Parties (Form 1295) to the Owner with the signed Agreement as required by Tex. Gov't Code Section 2252.908.

ARTICLE 11 – VENUE

- 11.01 Contractor agrees that venue lies exclusively in Jefferson County, Texas for any legal action.

ARTICLE 12 – PROJECTMATES REQUIREMENT

- 12.01 The Awarded Vendor will be required to use Projectmates software throughout the life of this project from award to closeout. The City will provide a license to be used by the Awarded Vendor at no cost. Projectmates by Systemates, Inc., is a construction management tool that allows users to manage the entire project life cycle from concept to closeout. All RFI's, Schedules, Daily Reports, Change Orders, Pay Requests, and any procedures related to contract management will be processed through Projectmates. The City reserves the right to rescind an award from a Vendor who refuses to use Projectmates during the life of the project. Such refusal will be noted and considered when awarding future projects.

ARTICLE 13 – CONTRACT DOCUMENTS

- 13.01 Contract Documents
- A. Specifications Sections listed in Section 00 01 10 "Table of Contents" except as specifically excluded in Paragraph 12.02.
 - B. Drawings listed in the Sheet Index on the Drawings.
 - C. Addenda (Numbers 00 91 01 to 00 91 [XX], inclusive).
 - D. The following are also Contract Documents which may be delivered or issued on or after the Effective Date of the Contract:
 - 1. Notice to Proceed.
 - 2. Contract Amendment(s).
 - 3. Change Order(s).

4. Field Order(s).
 5. Work Change Directive(s).
- E. There are no Contract Documents other than those listed above in this Paragraph. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

13.02 Bidding Requirements and Informational Documents

- A. The following Bidding Requirements are not Contract Documents:
1. Section 00 11 16 "Invitation to Bid."
 2. Section 00 21 13 "Instructions to Offerors."
 3. Section 00 41 13 "Bid Form."
 4. Section 00 41 16 "Bid Form Exhibit A."
 5. Section 00 43 13 "Bid Bond."
 6. Section 00 45 01 "Nonresident Bidders."
 7. Section 00 45 02 "Non-Collusion Certification."
 8. Section 00 45 03 "Conflict of Interest Questionnaire."
 9. Section 00 45 04 "State Sales Tax Requirements."
 10. Section 00 45 13 "Qualifications Statement."

The Effective Date of the Contract is **[date to be inserted at the time of contract execution]**.

Owner: _____
(typed or printed)

Contractor: _____
(typed or printed)

By: _____
(individual's signature)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Title: _____
(typed or printed)
(Attach evidence of authority to sign)

Address for giving notice:

Address for giving notice:

Designated representative:

Designated representative:

Name: _____

Name: _____

Title: _____

Title: _____

Address: _____

Address: _____

Phone: _____

Phone: _____

Email: _____

Email: _____

END OF SECTION

00 61 13 PERFORMANCE BOND

<p>Contractor as Principal</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>
<p>Owner</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Physical address (principal place of business):</p> <p>Telephone (Main):</p> <p>Telephone (Claims):</p>
<p>Contract</p> <p>Project name and number:</p> <p>Contract Price:</p> <p>Effective Date of Contract:</p>	<p>Surety's state of incorporation:</p> <p><i>By submitting this bond, Surety affirms that it is licensed to provide and execute this bond and authorized to do business in Texas.</i></p>
<p>Bond</p> <p>Bond Amount: 100 percent of Contract Price</p> <p>Date of Bond:</p> <p>(Date of Bond cannot be earlier than Effective Date of Contract)</p>	<p>Local Agent for Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p> <p>Telephone (Main):</p> <p><i>The address of the surety company to which any notice of claim should be sent may be obtained from the Texas Dept. of Insurance by calling the following toll-free number: 1-800-252-3439.</i></p>

Surety and Contractor, intending to be legally bound and obligated to Owner, do each cause this performance bond to be duly executed on its behalf by its authorized officer, agent, or representative. The Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally to this bond. The condition of this obligation is such that if the Contractor as Principal faithfully performs the Work required by the Contract then this obligation will be null and void; otherwise the obligation is to remain in full force and effect. Provisions of this bond shall be pursuant to the terms and provisions of Texas Government Code Chapter 2253 as amended and all liabilities on this bond shall be determined in accordance with the terms and provisions of said Chapter to the same extent as if it were copied at length herein. Venue lies exclusively in Jefferson County, Texas for any legal action.

Contractor as Principal Signature: _____ Name: _____ Title: _____ Email: _____	Surety Signature: _____ Name: _____ Title: _____ Email: _____ <i>(Attach Power of Attorney and place surety seal below)</i>
---	---

END OF SECTION

00 61 16 PAYMENT BOND

<p>Contractor as Principal</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>
<p>Owner</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Physical address (principal place of business):</p> <p>Telephone (Main):</p> <p>Telephone (Claims):</p>
<p>Contract</p> <p>Project name and number:</p> <p>Contract Price:</p> <p>Effective Date of Contract:</p>	<p>Surety's state of incorporation:</p> <p><i>By submitting this bond, Surety affirms that it is licensed to provide and execute this bond and authorized to do business in Texas.</i></p> <p>Local Agent for Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>
<p>Bond</p> <p>Bond Amount: 100 percent of Contract Price</p> <p>Date of Bond:</p> <p>(Date of Bond cannot be earlier than Effective Date of Contract)</p>	<p>Telephone (Main):</p> <p><i>The address of the surety company to which any notice of claim should be sent may be obtained from the Texas Dept. of Insurance by calling the following toll-free number: 1-800-252-3439.</i></p>

Surety and Contractor intending to be legally bound and obligated to Owner do each cause this payment bond to be duly executed on its behalf by its authorized officer, agent, or representative. The Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally to this bond. The condition of this obligation is such that if the Contractor as Principal pays all claimants providing labor or materials to Contractor or to a Subcontractor in the prosecution of the Work required by the Contract then this obligation will be null and void; otherwise the obligation is to remain in full force and effect. Provisions of the bond shall be pursuant to the terms and provisions of Texas Government Code Chapter 2253 as amended and all liabilities on this bond shall be determined in accordance with the terms and provisions of said Chapter to the same extent as if it were copied at length herein. Venue lies exclusively in Jefferson County, Texas for any legal action.

Contractor as Principal

Signature: _____
 Name: _____
 Title: _____
 Email: _____

Surety

Signature: _____
 Name: _____
 Title: _____
 Email: _____

(Attach Power of Attorney and place surety seal below)

END OF SECTION

00 61 19 MAINTENANCE BOND

<p>Contractor as Principal</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>
<p>Owner</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>	<p>Physical address (principal place of business):</p> <p>Telephone (Main):</p> <p>Telephone (Claims):</p>
<p>Contract</p> <p>Project name and number:</p> <p>Contract Price:</p> <p>Effective Date of Contract:</p>	<p>Surety's state of incorporation:</p> <hr/> <p><i>By submitting this bond, Surety affirms it is authorized to do business and licensed to execute bonds in Texas.</i></p> <hr/> <p>Local Agent for Surety</p> <p>Name:</p> <p>Mailing address (principal place of business):</p>
<p>Bond</p> <p>Bond Amount: 25 percent of Contract Price</p> <p>Bond Duration: 365 calendar days after expiration of one-year correction period</p> <p>Bond Date:</p> <p>(Date of Bond cannot be earlier than Effective Date of Contract)</p>	<p>Telephone (Main):</p>

Surety and Contractor, intending to be legally bound and obligated to Owner do each cause this maintenance bond to be duly executed on its behalf by its authorized officer, agent, or representative. The Contractor and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally to this bond. The condition of this obligation is such that if the Contractor faithfully performs maintenance work required by the Contract Documents then this obligation will be null and void; otherwise the obligation is to remain in full force and effect. Provisions of the bond shall be pursuant to the terms and provisions of the Contract Documents with regard to the continued maintenance of the Project for the period specified in the Contract Documents. All liabilities on this bond will be determined in accordance with the provisions of said Contract Documents to the same extent as if they were copied at length herein. Venue lies exclusively in Jefferson County, Texas for any legal action.

Contractor as Principal	Surety
Signature: _____	Signature: _____
Name: _____	Name: _____
Title: _____	Title: _____
Email: _____	Email: _____
	<i>(Attach Power of Attorney)</i>

END OF SECTION

00 61 20 MAINTENANCE BOND REQUIREMENTS

ARTICLE 1 – MAINTENANCE BOND REQUIREMENTS

- 1.01 Provide a maintenance bond that complies with the requirements of this Section. A maintenance bond is defined as a performance bond that extends the correction period for a specified period of time beyond the one-year correction period described in the General Conditions.
- 1.02 Provide a maintenance bond that begins at the end of the one-year correction period and continues for the period stated in Section 00 61 19 “Maintenance Bond.”
- 1.03 Provide a maintenance bond in the amount stated in Section 00 61 19 “Maintenance Bond.”
- 1.04 Provide a maintenance bond that meets the same requirements for bonds as the Contractor’s performance bond as described in the Contract Documents.
- 1.05 Surety for the maintenance bond must meet the same requirements for the performance and payment bonds as set forth in the General Conditions.
- 1.06 Indemnification provisions of the General Conditions apply to the maintenance bond period.

ARTICLE 2 – DOCUMENTATION

- 2.01 Provide a maintenance bond using the form provided in Section 00 61 19 “Maintenance Bond.”
- 2.02 Comply with the requirements of Section 01 70 00 “Execution and Closeout Requirements.”

ARTICLE 3 – CORRECTIVE ACTION DURING THE MAINTENANCE BOND PERIOD

- 3.01 Correct Defective Work during the one-year correction period in accordance with the General Conditions.
- 3.02 Correct Defective Work during the maintenance bond period just as required for the one-year correction period specified in the General Conditions. Provide labor and materials required to correct Defective Work or correct Work that does not function as required by the Contract Documents.
- 3.03 Correction of Defective Work during the maintenance bond period does not extend the correction period as is required under the provisions of the one-year correction period described in the General Conditions.
- 3.04 Promptly correct damages to the Site or adjacent areas that Contractor has arranged to use through construction easements or other agreements. Promptly correct damages to the Work or the work of others. Make the corrections without cost to Owner.
- 3.05 Owner may correct Defective Work without notice to the Contractor in an emergency where delay would cause serious risk of loss or damage.
- 3.06 Include the cost for correcting Defective Work during the maintenance bond period in the Contract Price. Include all costs associated with providing the maintenance bond in the Contract Price.

- 3.07 Reimburse the Owner for engineering and special services required to be furnished by the Owner which are directly attributable to the corrective Work.
- 3.08 Remedy for Failure to Correct Defective Work:
- A. Owner may correct Defective Work if the Contractor fails or refuses to perform corrective Work within 10 days after Owner notifies the Contractor of Defective Work.
 - B. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this paragraph are to be paid by the Contractor or its surety. These claims, costs, losses, and damages include costs of repair and the cost of replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's Defective Work. Owner is not required to obtain the lowest price for the Work performed when exercising its rights or remedies under this paragraph.

ARTICLE 4 – INSURANCE REQUIREMENTS

- 4.01 Provide insurance as required by the Contract Documents during the maintenance bond period. Provide evidence of insurance prior to beginning corrective Work if evidence of insurance is not current.

END OF SECTION

00 70 01 NOTICE OF AWARD

Date: _____, 20____

To: _____
(Bidder)

Address: _____

Attention: _____

At its meeting held _____ the City Council of the City of Beaumont awarded your firm the contract for:

**PINE STREET SWTP POLYMER SYSTEM AND CHEMICAL STORAGE TANK IMPROVEMENTS
BID NO. WU0122-12**

Said Award being based on your apparent successful Bid dated _____ and bearing a total Bid Price of:

_____ Dollars (\$_____)

Work to be performed under this contract is to be completed within **270** calendar days.

You must comply with the following conditions within fourteen (14) calendar days of the date of this Notice of Award,
by _____, 20_____.

1. You must deliver to the Owner four fully executed counterparts of the Agreement. Each of the Contract Documents must bear your signature where indicated.
2. You must deliver with the executed Agreement, the executed Payment and Performance Bonds (with Surety's Power of Attorney attached) and the Insurance Certificates as specified in the Instructions to Bidders, the General Conditions (Article 5.2), and the Supplementary General Conditions.

Questions should be addressed to: John Pippins III, Water Utilities Design Manager at (409)785-4702.

Failure to comply with these conditions within the time specified will entitle the Owner to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within fourteen (14) calendar days after you comply with these conditions, the Owner will return to you a fully executed copy of the Contract Documents.

CITY OF BEAUMONT, TEXAS

By: _____

Title: City Engineer

00 70 02 NOTICE TO PROCEED

Date: _____, 20____

To: _____

Address: _____

Contract for: PINE STREET SWTP POLYMER SYSTEM AND CHEMICAL STORAGE TANK
IMPROVEMENTS, BID NO. WU0122-12

You are hereby notified that the Contract Time under the above Contract will commence on:

_____, 20_____.

By that date, you are to start performing your obligations under the Contract Documents. In accordance with the provisions for beginning and completion of the work in the section of the Contract Documents entitled Summary of Work, the Time and Date of Completion is:

270 Calendar after the date of commencement of the work specified above, or not later than

_____, 20_____.

Before you start any work at the site, Paragraph 2.5 of the General Conditions provides that you must study the Contract Documents and verify figures and field dimensions, and must report any observed errors or discrepancies. You must also submit to the Engineer all those documents called for in the section entitled Contractor Submittals in the Technical Specifications.

Also, before you may start any work at the site, you must:

- 1. Notify Public Works Engineering at least 24 hours before work will commence.**
- 2. Submit Shop Drawings for Approval.**
- 3. Submit CPM Work Schedule.**
- 4. Obtain TPDES/TCEQ General Construction Permit, Notice to Proceed, and Construction Site Notice (TXR150000).**

CITY OF BEAUMONT, TEXAS

By: _____

Title: City Engineer

END OF SECTION

00 72 00 GENERAL CONDITIONS

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	5
1.01 Defined Terms	5
1.02 Terminology	10
Article 2 – Preliminary Matters.....	12
2.01 Delivery of Bonds and Evidence of Insurance.....	12
2.02 Copies of Documents.....	12
2.03 Before Starting Construction	12
2.04 Electronic Transmittals	13
Article 3 – Contract Documents: Intent, Requirements, Reuse.....	13
3.01 Intent	13
3.02 Reference Standards.....	14
3.03 Reporting and Resolving Discrepancies	15
3.04 Interpretation of the Contract Documents.....	16
3.05 Reuse of Documents	16
Article 4 – Commencement and Progress of the Work	16
4.01 Commencement of Contract Times; Notice to Proceed	16
4.02 Progress Schedule.....	16
4.03 Delays in Contractor’s Progress	17
Article 5 – Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions.....	18
5.01 Availability of Lands	18
5.02 Use of Site and Other Areas.....	18
5.03 Subsurface and Physical Conditions	19
5.04 Differing Subsurface or Physical Conditions	20
5.05 Underground Facilities.....	21
5.06 Hazardous Environmental Conditions at Site	23
Article 6 – Bonds and Insurance	24
6.01 Performance, Payment, and Other Bonds	24
6.02 Licensed Sureties	25
6.03 Insurance - General Provisions	25
Article 7 – Contractor’s Responsibilities	26
7.01 Contractor’s Means and Methods of Construction	26
7.02 Supervision and Superintendence	27
7.03 Labor; Working Hours.....	27

7.04	Services, Materials, and Equipment	27
7.05	Concerning Subcontractors, and Suppliers.....	28
7.06	Patent Fees and Royalties.....	29
7.07	Permits.....	29
7.08	Taxes.....	29
7.09	Laws and Regulations	29
7.10	Safety and Protection	30
7.11	Hazard Communication Programs.....	31
7.12	Emergencies.....	31
7.13	Contractor's General Warranty and Guarantee	31
7.14	Correction Period.....	32
7.15	Indemnification.....	33
7.16	Delegation of Professional Design Services	33
Article 8 – Other Work at the Site		34
8.01	Other Work	34
8.02	Coordination	35
8.03	Legal Relationships	35
Article 9 – Owner's and OPT's Responsibilities		36
9.01	Communications to Contractor	36
9.02	Replacement of Owner's Project Team Members.....	36
9.03	Furnish Data.....	36
9.04	Pay When Due	36
9.05	Lands and Easements; Reports and Tests.....	36
9.06	Insurance	36
9.07	Modifications.....	36
9.08	Inspections, Tests, and Approvals.....	36
9.09	Limitations on OPT's Responsibilities	36
9.10	Undisclosed Hazardous Environmental Condition.....	37
9.11	Compliance with Safety Program	37
Article 10 – Design Professional's and Construction Manager's Status During Construction		37
10.01	Owner's Representative	37
10.02	Visits to Site	37
10.03	Rejecting Defective Work	37
10.04	Decisions on Requirements of Contract Documents and Acceptability of Work	38
Article 11 – Changes to the Contract.....		38
11.01	Amending and Supplementing the Contract Documents	38
11.02	Contract Amendments.....	39

11.03	Change Orders	39
11.04	Work Change Directives	40
11.05	Field Orders	40
11.06	Change Proposals	40
11.07	Change of Contract Price; Contract Times	41
11.08	Execution of Change Orders and Contract Amendments	41
11.09	Notice to Surety	42
Article 12 – Claims		42
12.01	Claims	42
Article 13 – Cost of the Work; Allowances; Unit Price Work		43
13.01	Cost of the Work	43
13.02	Allowances	46
13.03	Unit Price Work	47
13.04	Contingencies	47
Article 14 – Tests and Inspections; Correction, Removal, or Acceptance of Defective Work		48
14.01	Access to Work	48
14.02	Tests, Inspections, and Approvals	48
14.03	Defective Work	49
14.04	Acceptance of Defective Work	49
14.05	Uncovering Work	50
14.06	Owner May Stop the Work	50
14.07	Owner May Correct Defective Work	51
Article 15 – Payments to Contractor; Set-offs; Final Completion		51
15.01	Progress Payments	51
15.02	Contractor’s Warranty of Title	53
15.03	Substantial Completion	53
15.04	Partial Utilization	54
15.05	Final Inspection	54
15.06	Final Payment	54
15.07	Waiver of Claims	55
Article 16 – Suspension of Work and Termination		55
16.01	Owner May Suspend Work	55
16.02	Owner May Terminate for Cause	55
16.03	Owner May Terminate for Convenience	56
16.04	Contractor May Stop Work or Terminate	57
Article 17 – Final Resolution of Disputes		57
17.01	Methods and Procedures	57

Article 18 – Miscellaneous.....	58
18.01 Computation of Times	58
18.02 Independent Contractor	58
18.03 Cumulative Remedies	58
18.04 Limitation of Damages	58
18.05 No Waiver	58
18.06 Severability	58
18.07 Survival of Obligations	59
18.08 No Third-Party Beneficiaries	59
18.09 Successors and Assigns	59
18.10 Assignment of Contract	59
18.11 No Waiver of Sovereign Immunity.....	59
18.12 Controlling Law	59

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

- A. A term with initial capital letters, including the term's singular and plural forms, has the meaning indicated in this Paragraph wherever used in the Bidding Requirements or Proposal Requirements or Contract Documents. In addition to the terms specifically defined, terms with initial capital letters in the Contract Documents may include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Documents issued prior to the receipt of Bids or Proposals which clarify or modify the Bidding Requirements/Proposal Requirements or the proposed Contract Documents.
 2. *Agreement*—The document signed by Owner and Contractor that establishes the Contract Price and Contract Times, and designates the specific documents that are Contract Documents.
 3. *Application for Payment*—The documents used by Contractor to request payments from Owner and the supporting documentation required by the Contract Documents.
 4. *Bid; Proposal*—An offer submitted to Owner for the Project setting forth the Contract Price and Contract Times for the Work to be performed.
 5. *Bidding Documents; Proposal Documents*—The Bidding Requirements or Proposal Requirements, the proposed Contract Documents, and Addenda.
 6. *Bidding Requirements; Proposal Requirements*—The Invitation to Bid or Request for Proposals, Instructions to Offerors, Bid Security or Proposal Security, Bid Form or Proposal Form and attachments, and required certifications and affidavits.
 7. *Bid Security; Proposal Security*—The financial security provided by Offeror at the time the Bid or Proposal is submitted and held by Owner until the Agreement is executed and the evidence of insurance and bonds required by the Contract Documents are provided.
 8. *Change Order*—A document issued on or after the Effective Date of the Contract and signed by Owner and Contractor which modifies the Work, Contract Price, Contract Times, or terms and conditions of the Contract.
 9. *Change Proposal*—A document submitted by Contractor in accordance with the requirements of the Contract Documents:
 - a. Requesting an adjustment in Contract Price or Contract Times;
 - b. Contesting an initial decision concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents;
 - c. Challenging a Set-off against payment due; or
 - d. Seeking other relief with respect to the terms and conditions of the Contract.
 10. *Claim*—A demand or assertion by Owner or Contractor submitted in accordance with the requirements of the Contract Documents. A demand for money or services by an entity other than Owner or Contractor is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning any hazardous, toxic, or dangerous waste, substance, or material.
12. *Construction Manager*—The individual or entity named as Construction Manager in the Agreement and the consultants, subconsultants, individuals, or entities directly or indirectly employed or retained by them to provide construction management as advisor services to Owner.
13. *Construction Manager at Risk (CMAR)*—The individual or entity selected by Owner to construct the Project using the Construction Manager at Risk project delivery method. The term Contractor means Construction Manager at Risk in the Contract Documents when the Construction Manager at Risk project delivery method is used.
14. *Contract*—The entire integrated set of documents concerning the Work and describing the relationship between the Owner and Contractor.
15. *Contract Amendment*—A document issued on or after the Effective Date of the Contract and signed by Owner and Contractor which:
 - a. Authorizes new phases of the Work and establishes the Contract Price, Contract Times, or terms and conditions of the Contract for the new phase of Work; or
 - b. Modifies the terms and conditions of the Contract, but does not make changes in the Work.
16. *Contract Documents*—Those items designated as Contract Documents in the Agreement.
17. *Contract Price*—The monetary amount stated in the Agreement and as adjusted by Modifications, and increases or decreases in unit price quantities, if any, that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
18. *Contract Times*—The number of days or the dates by which Contractor must achieve specified Milestones, achieve Substantial Completion, and complete the Work.
19. *Contractor*—The individual or entity with which Owner has contracted to perform the Work.
20. *Contractor's Team*—Contractor, Subcontractors, Suppliers, and individuals or entities directly or indirectly employed or retained by Contractor, Subcontractors, or Suppliers to perform part of the Work, or anyone for whose acts they may be liable.
21. *Cost of the Work*—The sum of costs incurred for the performance of the Work as allowed by Article 13.
22. *Day*—A day of 24 hours measured from midnight to the next midnight.
23. *Defective*—When applied to Work, refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. Does not conform to the Contract Documents;

- b. Does not meet the requirements of applicable inspections, reference standards, tests, or approvals referred to in the Contract Documents; or
 - c. Has been damaged prior to Construction Manager's recommendation of final payment unless responsibility for the protection of the Work has been assumed by Owner at Substantial Completion in accordance with Article 15.
24. *Design Professional*—The individuals or entity named as the Architect or Engineer in the Agreement and the subconsultants, individuals, or entities directly or indirectly employed or retained by Design Professional to provide design or other technical services to Owner. Design Professional has responsibility for design and technical issues related to the Contract Documents.
25. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work. Shop Drawings and other documents generated by Contractor's Team are not Drawings.
26. *Effective Date of the Contract*—The date indicated in the Agreement on which the Contract becomes effective.
27. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including Shop Drawings and other Submittals, that are in an electronic or digital format.
28. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
29. *Field Order*—A document issued by Construction Manager or Design Professional requiring changes in the Work that do not change the Contract Price or the Contract Times.
30. *Final Completion*—The point where the Work is complete in accordance with the Contract Documents, items and documents required by the Contract Documents have been accepted by Owner and the Project is ready for Final Payment.
31. *Guaranteed Maximum Price (GMP)*—The maximum amount to be paid by Owner for the sum of the Cost of the Work plus Contractor's fee as set forth in the Agreement, subject to increases or decreases for changes in the Work, when the Construction Manager at Risk project delivery method is used.
32. *Hazardous Environmental Condition*—The presence of Constituents of Concern at the Site in quantities or circumstances that may present a danger to persons or property exposed to Constituents of Concern. The presence of Constituents of Concern at the Site necessary for the execution of the Work or to be incorporated into the Work is not a Hazardous Environmental Condition provided these Constituents of Concern are

controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract.

- a. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
33. *Indemnified Costs*—All costs, losses, judgments, and damages resulting from claims or demands against Owner’s Indemnitees. These costs include fees for design professionals, attorneys, and other professionals and any legal, court, arbitration, or other dispute resolution costs.
 34. *Laws and Regulations; Laws or Regulations*—Applicable laws, statutes, rules, regulations, ordinances, codes, permits, and binding decrees, resolutions, and orders of governmental bodies, agencies, authorities, and courts having jurisdiction over the Project.
 35. *Liens*—Charges, security interests, or encumbrances upon Contract related funds, real property, or private property.
 36. *Manufacturer*—The individual or entity that designs, casts, fabricates, manufactures, assembles, tests, and provides materials or equipment to be incorporated in the Work.
 37. *Milestone*—A principal event in the performance of the Work that Contractor is required by Contract to complete by a specified date or within a specified time.
 38. *Modification*—Change made to the Contract Documents by Contract Amendment, Change Order, Field Order, or Work Change Directive.
 39. *Notice of Award*—The notice of Owner’s acceptance of the Successful Offeror’s Bid or Proposal.
 40. *Notice to Proceed*—A notice to Contractor of the Contract Times and the date Work is to begin.
 41. *Offeror*—An individual or entity that submits a Bid or Proposal to Owner.
 42. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
 43. *Owner’s Budget*—The amount budgeted by Owner for the construction of the Project.
 44. *Owner’s Indemnitees*—Each member of OPT and their officers, directors, members, partners, employees, agents, consultants, and subcontractors.
 45. *Owner’s Project Team (OPT)*—The Owner, Design Professional, Construction Manager, and the other entities identified in the Supplementary Conditions and the consultants, subconsultants, individuals or entities directly or indirectly employed or retained by them to provide services to Owner.

46. *Progress Schedule*—A schedule prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
47. *Project*—The total undertaking to be accomplished for Owner under the Contract Documents.
48. *Project Construction Manager (PCM)*—The authorized representative of OPT assigned to assist Construction Manager at the Site. The term Project Construction Manager includes assistants and field staff of Construction Manager.
49. *Project Management Information System (PMIS)*—The online project management system that will be used by OPT and Contractor to submit and share documentation and other related communications and information for this Project.
50. *Samples*—Physical examples of materials, equipment, or workmanship representing some portion of the Work that are used to establish the standards for that portion of the Work.
51. *Schedule of Anticipated Payments*—A detailed tabulation, prepared and maintained by Contractor, showing the anticipated amount of each Application for Payment and the month in which they will be submitted.
52. *Schedule of Submittals*—A detailed tabulation, prepared and maintained by Contractor, of each required submittal and the time requirements for review and approval of each submittal.
53. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for Contractor’s Applications for Payment.
54. *Set-off*—A reduction in payment due to Contractor under Article 15.
55. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by Contractor’s Team and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
56. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed. The Site includes rights-of-way, easements, and other lands or areas furnished by Owner which are designated for use by Contractor.
57. *Specifications*—The part of the Contract that describes the requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
58. *Subcontractor*—An individual or entity having a direct contract with Contractor or with other Subcontractors or Suppliers for the performance of a part of the Work.
59. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Construction Manager, or that is indicated as a Submittal in the Schedule of Submittals accepted by Construction Manager. Submittals, whether approved or accepted by OPT, are not Contract Documents.

60. *Substantial Completion*—The point where the Work or a specified part of the Work is sufficiently complete to be used for its intended purpose in accordance with the Contract Documents.
61. *Successful Offeror*—The Offeror to which Owner awards the Contract.
62. *Supplementary Conditions*—The part of the Contract that amends or supplements the General Conditions.
63. *Supplier*—A Manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with Subcontractors or other Suppliers to furnish materials or equipment to be incorporated in the Work.
64. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions with respect to either:
 - a. Existing subsurface conditions at or adjacent to the Site;
 - b. Existing physical conditions at or adjacent to the Site including existing surface or subsurface structures at the Site, except Underground Facilities; or
 - c. Hazardous Environmental Conditions at the Site.
65. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
66. *Unit Price Work*—Work to be paid for based on unit prices.
67. *Work*—The construction of the Project or its component parts as required by the Contract Documents. Work includes and is the result of performing and providing all labor, services, and documentation to construct the Project; providing all materials and equipment to be incorporated into the Project, and providing related services for testing, startup and commissioning, all as required by the Contract Documents.
68. *Work Change Directive*—A directive issued to Contractor on or after the Effective Date of the Contract ordering an addition, deletion, or revision in the Work. The Work Change Directive serves as a memorandum of understanding regarding the directive until a Change Order can be issued.

1.02 Terminology

- A. The words and terms discussed in this Paragraph 1.02 are not defined terms that require initial capital letters, but when used in the Bidding Requirements or Proposal Requirements or Contract Documents, have the indicated meaning.
- B. Contract Documents are written using imperative language:
 1. Simple imperative sentence structure is used which places a verb as the first word in the sentence. It is understood that the words “furnish,” “install,” “perform,” “provide,”

or similar words include the meaning of the phrase "Contractor shall..." before these words.

2. Unless specifically stated that action is to be taken by OPT or others, it is understood that the action described is a requirement of Contractor.
- C. The use of the words "furnish," "install," "perform," and "provide" have the following meanings when used relating to services, materials, or equipment:
1. Furnish means to supply and deliver the specified services, materials, or equipment to the Site or other specified location ready for use or installation.
 2. Install means to complete construction or assembly of the specified services, materials, or equipment so they are ready for their intended use.
 3. Perform or provide means to furnish and install specified services, materials, or equipment, complete and ready for their intended use.
 4. Perform or provide the specified services, materials, or equipment complete and ready for intended use if the Contract Documents require specific services, materials, or equipment, but do not expressly use the words "furnish," "install," "perform," or "provide."
- D. The meaning and intent of certain terms or adjectives are described as follows:
1. The terms "as allowed," "as approved," "as ordered," "as directed," or similar terms in the Contract Documents indicate an exercise of professional judgment by OPT.
 2. Adjectives like "reasonable," "suitable," "acceptable," "proper," "satisfactory," or similar adjectives are used to describe a determination of OPT regarding the Work.
 3. Any exercise of professional judgment by OPT will be made solely to evaluate the Work for general compliance with the Contract Documents unless there is a specific statement in the Contract Documents indicating otherwise.
 4. The use of these or similar terms or adjectives does not assign a duty or give OPT authority to supervise or direct the performance of the Work, or assign a duty or give authority to OPT to undertake responsibilities contrary to the provisions of Article 9, Article 10 or other provisions of the Contract Documents.
- E. Requirements apply to all Work of the same kind, class, and type even though the word "all" or "any" is not stated.
- F. The terms "includes" and "including" are used as terms of enlargement and not of limitation or exclusive enumeration, and use of these terms does not create a presumption that components not expressed are excluded. The terms "consist of" or "consisting of" limits the interpretation to only those items specifically listed.
- G. It is understood that the cost of providing Work is included in the Contract Price and no additional compensation is to be paid by Owner unless specifically stated otherwise in the Contract Documents. Expressions like "at no additional cost to Owner," "at Contractor's expense," or similar words mean that Contractor is to include the cost of this Work in their Contract Price and perform or provide specified Work without an increase in the Contract Price.

- H. Words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with this recognized meaning unless stated otherwise in the Contract Documents.
- I. Written documents are required where reference is made to notices, reports, approvals, consents, statements, instructions, opinions, or other types of documentation or communications required by the Contract Documents. Approval and consent documents must be received by Contractor prior to the action or decision for which approval or consent is given. These may be made in printed or electronic format through OPT's Project Management Information System or other electronic media as required by the Contract Documents or approved by Construction Manager.
- J. Giving notice as required by the Contract Documents may be by printed or electronic media using a method that requires acknowledgment of the receipt of that notice.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

- A. Provide required bonds and evidence of insurance required by the Contract Documents to Construction Manager with the executed Agreement.
- B. Evidence of insurance must include copies of the insurance policies, including all endorsements, and identification of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 Copies of Documents

- A. OPT will furnish one copy of the executed Contract Documents in electronic portable document format (PDF). This document is the Project Record Copy of the Contract Documents.

2.03 Before Starting Construction

- A. Provide the following preliminary documents in accordance with the Contract Documents within 10 days after the Effective Date of the Contract:
 - 1. Progress Schedule;
 - 2. Schedule of Submittals;
 - 3. Schedule of Values; and
 - 4. Schedule of Anticipated Payments.
- B. Designate the specific individuals authorized to act as representatives of Contractor. These individuals must have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of Contractor.
- C. Owner will designate the specific individuals authorized to act as representatives of Owner and the limits of their authority regarding acting on behalf of Owner.

2.04 Electronic Transmittals

- A. Except as otherwise stated elsewhere in the Contract Documents, the OPT and Contractor will send and accept Electronic Documents sent by Electronic Means using the protocols specified in Section 01 33 00 "Document Management."

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

- A. Requirements of each part of the Contract Documents are as binding as if required by all Contract Documents. It is the intent of the Contract Documents to describe a functionally complete project. The Contract Documents do not indicate or describe all the Work required to complete the Project. Additional details required for construction of the Project are to be provided by Contractor and coordinated with OPT.
- B. Provide the labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result, whether specifically called for in the Contract Documents or not. Include these related costs in the offered Contract Price.
- C. Provide equipment that is functionally complete as described in the Contract Documents. The Drawings and Specifications do not indicate or describe all the Work required to complete the installation of equipment purchased by the Owner or Contractor. Additional details required for the correct installation of selected equipment are to be provided by Contractor and coordinated with Design Professional through Construction Manager.
- D. Comply with the most stringent requirements where compliance with two or more standards is specified and they establish different or conflicting requirements for the Work, unless the Contract Documents indicate otherwise.
- E. Provide materials and equipment comparable in quality to similar materials and equipment incorporated in the Project or as required to meet the minimum requirements of the application if the materials and equipment are shown in the Drawings but are not included in the Specifications.
- F. The Project Record Copy of the Contract Documents governs if there is a discrepancy between the Project Record Copy of the Contract Documents and subsequent electronic or digital versions of the Contract Documents, including printed copies derived from these electronic or digital versions.
- G. The Contract supersedes all prior written or oral negotiations, representations, and agreements. The Contract Documents comprise the entire Agreement between Owner and Contractor. The Contract Documents may be modified only by a Modification.
- H. Request clarification from Construction Manager for a decision before proceeding if Contractor is not clear on the meaning of the Contract Documents. Construction Manager is to issue clarifications and interpretations of the Contract Documents in accordance with the Contract Documents.

I. Organization of the Documents:

1. Organization of the Contract Documents is not intended to control or lessen the responsibility of Contractor when dividing Work among Subcontractors or Suppliers, or to establish the extent of Work to be performed by trades, Subcontractors, or Suppliers, except on multi-prime contracts. Specifications or details do not need to be indicated or specified in each Specification or Drawing. Items shown in the Contract Documents are applicable regardless of their location in the Contract Documents.
2. Standard Paragraph titles and other identifications of subject matter in the Specifications are intended to aid in locating and recognizing various requirements of the Specifications. Titles do not define, limit, or otherwise restrict Specification text.
3. The Contract requirements described in the General Conditions, Supplementary Conditions, and General Requirements (Division 01 Sections of the Specifications) apply to Work regardless of where it is described in the Contract Documents, unless specifically noted otherwise.
4. Specifications or details do not need to be indicated or specified in each Specification or Drawing. Items shown in the Contract Documents are applicable regardless of their location in the Contract Documents.

J. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

K. Nothing in the Contract Documents creates:

1. a contractual relationship between OPT and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
2. an obligation on the part of OPT to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 Reference Standards

A. Standard Specifications, Codes, Laws and Regulations:

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of technical societies, organizations, or associations, or to Laws or Regulations, whether specific or implied, are those in effect at the time Contractor's Bid or Proposal is submitted or when Contractor negotiates the Contract Price unless specifically stated otherwise in the Contract Documents.
2. No provision of referenced standard specifications, manuals, reference standards, codes, or instructions of a Supplier changes the duties or responsibilities of OPT or Contractor from those described in the Contract Documents or assigns a duty to or gives authority to OPT to supervise or direct the performance of the Work or undertake responsibilities inconsistent with the Contract Documents.

3. The provisions of the Contract Documents take precedence over standard specifications, manuals, reference standards, codes, or instructions of a Supplier unless specifically stated otherwise in the Contract Documents.
- B. Comply with applicable construction industry standards, whether referenced or not.
 1. Standards referenced in the Contract Documents govern over standards not referenced but recognized as applicable in the construction industry.
 2. Comply with the requirements of the Contract Documents if they produce a higher quality of Work than the applicable construction industry standards.
 3. Submit questions regarding which code or standard is applicable to Construction Manager. Design Professional will determine whether a code or standard is applicable, which of several codes or standards are applicable, or if the Contract Documents produce a higher quality of Work. Construction Manager will respond to the question as appropriate.
- C. Make copies of reference standards available if requested by Construction Manager.

3.03 Reporting and Resolving Discrepancies

- A. Reporting Discrepancies:
 1. Carefully study the Drawings and verify pertinent figures and dimensions with respect to actual field measurements before undertaking the Work. Immediately report conflicts, errors, ambiguities, or discrepancies that Contractor discovers or has actual knowledge of to Construction Manager.
 2. Immediately notify the Construction Manager of conflicts, errors, ambiguities, or discrepancies in the Contract Documents or discrepancies between the Contract Documents and:
 - a. Applicable Laws or Regulations;
 - b. Actual field conditions;
 - c. Standard specifications, manuals, reference standards, or codes; or
 - d. Instructions of Suppliers.
 3. Do not proceed with affected Work until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation from Construction Manager or by a Modification to the Contract Documents issued pursuant to Paragraph 11.01, except in an emergency as required by Paragraph 7.12.
 4. Contractor is liable to OPT for failure to report conflicts, errors, ambiguities, or discrepancies in the Contract Documents of which Contractor has actual knowledge.
 5. Contractor is deemed to have included the most expensive item, system, procedure, etc. in the Contract Price if a conflict, error, ambiguity, or discrepancy in the Contract Documents was known, but not reported prior to submitting the Bid or Proposal or when Contractor negotiates the Contract Price.

3.04 Interpretation of the Contract Documents

- A. Submit questions concerning the non-technical or contractual/administrative requirements of the Contract Documents to Construction Manager immediately after the question arises. Construction Manager will provide an interpretation of the Contract Documents regarding these questions and will coordinate the response of OPT to Contractor.
- B. Submit questions regarding the design of the Project described in the Contract Documents to Construction Manager immediately after the question arises. Construction Manager will request an interpretation of the Contract Documents from Design Professional. Construction Manager will coordinate the response of OPT to Contractor.
- C. OPT may initiate a Modification to the Contract Documents through Construction Manager if a response to the question indicates that a change in the Contract Documents is required. Contractor may appeal Design Professional's or Construction Manager's interpretation by submitting a Change Proposal.

3.05 Reuse of Documents

- A. Contractor's Team has no rights to the Contract Documents and may not use the Contract Documents or copies or electronic media editions of the Contract Documents other than for the construction of this Project. This provision survives final payment or termination of the Contract.
- B. Contractor can retain a copy of the Contract Documents for record purposes, unless specifically prohibited by Owner for security reasons. Surrender paper and digital copies of the Contract Documents and other related documents and remove these documents from computer equipment or storage devices as a condition of final payment if Owner so directs.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

- A. The Contract Times commence to run on the date indicated in the Notice to Proceed. If a Notice to Proceed is not issued, the Contract Times will commence to run 15 days after the Contract is signed by all parties.
- B. Begin performing the Work on the date indicated in the Notice to Proceed. Do not begin Work before the date indicated in the Notice to Proceed or prior to providing evidence that insurance required in Article 6 is in effect.

4.02 Progress Schedule

- A. Construct the Work in accordance with the Progress Schedule established in accordance with the Contract Documents.
 - 1. Adjust the Progress Schedule as required to accurately reflect actual progress on the Work.
 - 2. Submit proposed adjustments in the Progress Schedule that change the Contract Times in accordance with the requirements of Article 11.

- B. Continue performing Work and adhere to the Progress Schedule during disputes or disagreements with Owner. Do not delay or postpone Work pending resolution of disputes or disagreements, or during an appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree.

4.03 Delays in Contractor's Progress

- A. Contractor is not entitled to an adjustment in Contract Price or Contract Times for delays, disruptions, or interference caused by or within the control of Contractor's Team.
- B. Contractor is entitled to an equitable adjustment in Contract Price or Contract Times if OPT directly delays, disrupts, or interferes with the performance or progress of the Work. Contractor is not entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Owner if this delay is concurrent with a delay, disruption, or interference attributable to or within the control of Contractor's Team.
- C. Contractor is entitled to an equitable adjustment in the Contract Times, but not Contract Price, if Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of OPT or Contractor. These adjustments in Contract Times are Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. These unanticipated causes include:
 - 1. Severe and unavoidable natural catastrophes e.g. fires, floods, epidemics, and earthquakes;
 - 2. Acts of war or terrorism;
 - 3. Acts or failures to act of utility owners or other third-party entities other than those third-party utility owners performing other work at or adjacent to the Site as arranged by Owner and, as contemplated in Article 8;
 - 4. The existence of a differing subsurface or physical condition;
 - 5. An Underground Facility not shown or not indicated with reasonable accuracy by the Contract Documents;
 - 6. Hazardous Environmental Conditions; and
 - 7. Delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site unless this other work also for Owner.
- D. Contractor is entitled to an equitable adjustment in the Contract Times, but not Contract Price, if Contractor's performance or progress is delayed or disrupted by weather conditions provided such weather conditions exceed those that could normally be expected for the Site in that month of the year, unless other provisions for Weather related delays are included in the Contract Documents. Contractor is to include time associated with normal weather-related delays in the Project Schedule and assumes the risks, including costs, associated with delays related to normal weather conditions.
- E. Contractor is only entitled to an adjustment of the Contract Times for specific delays, disruptions, and interference to the performance or progress of the Work that can be

demonstrated to directly impact the ability of Contractor to complete the Work within the Contract Times. No adjustments in Contract Times are allowed for delays on components of the Work which were or could have been completed without impacting the Contract Times.

- F. Notify Construction Manager immediately of a potential delaying, disrupting, or interfering event. Submit a Change Proposal seeking an adjustment in Contract Price or Contract Times within 30 days of the commencement of the delaying, disrupting, or interfering event. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11. Change Proposal seeking an increase in Contract Times or Contract Price submitted must include supporting data that details the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference;
 5. A revised Progress Schedule indicating all the activities affected by the delay, disruption, or interference;
 6. An explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work;
 7. The impact on Contract Price; and
 8. Such additional supporting documentation as OPT may require.

ARTICLE 5 – SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

- A. Owner will furnish the Site and inform Contractor of encumbrances or restrictions known to Owner related to use of the Site with which Contractor must comply in performing the Work.
- B. Provide for additional lands and access Contractor requires for temporary construction facilities or storage of materials and equipment, other than those identified in the Contract Documents. Provide documentation of authority to use these additional lands to Construction Manager before using them.

5.02 Use of Site and Other Areas

- A. Confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Owner or Contractor has arranged to use through construction easements or agreements, and other adjacent areas as permitted by Laws and Regulations. Assume full responsibility for damage

or injuries which result from the performance of the Work or from other actions or conduct of Contractor's Team, including:

1. Damage to the Site;
 2. Damage to adjacent areas used for Contractor's Team's operations;
 3. Damage to other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and
 4. Injuries and losses sustained by the owners or occupants of these lands or areas.
- B. Take the following action if a damage or injury claim is made by the owner or occupant of adjacent land or area because of the performance of the Work, or because of other actions or conduct of Contractor's Team:
1. Take immediate corrective or remedial action as required by Paragraph 7.10; and
 2. Attempt to settle the claim through negotiations with the owner or occupant, or otherwise resolve the claim by mediation or other dispute resolution proceeding or at law; and
 3. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, INDEMNIFY AND HOLD HARMLESS OWNER'S INDEMNITEES FROM AND AGAINST ANY SUCH CLAIM AND ALL INDEMNIFIED COSTS ARISING OUT OF OR RELATING TO ANY CLAIM OR ACTION BROUGHT BY ANY SUCH OWNER OR OCCUPANT AGAINST OWNER'S INDEMNITEES TO THE EXTENT CAUSED DIRECTLY OR INDIRECTLY, IN WHOLE OR IN PART BY, OR BASED UPON, CONTRACTOR'S PERFORMANCE OF THE WORK, OR BECAUSE OF OTHER ACTIONS OR CONDUCT OF CONTRACTOR'S TEAM.**

5.03 Subsurface and Physical Conditions

- A. The Supplementary Conditions identify:
1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site, except Underground Facilities, that contain Technical Data; and
 3. Technical Data contained in these reports and drawings.
- B. If no Technical Data have been identified in the Supplementary Conditions, then Technical Data is defined, with respect to conditions at the Site, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, or environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
- C. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

- D. Contractor may rely upon the accuracy of the Technical Data contained in these reports and drawings, but these reports and drawings are not Contract Documents. Except for this reliance on Technical Data, Contractor may not rely upon or make claims against Owner's Indemniteses with respect to:
1. The completeness of reports and drawings for Contractor's purposes, including aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, or Contractor's safety precautions and programs;
 2. Other data, interpretations, opinions, and information contained in these reports or shown or indicated in the drawings;
 3. The contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. Contractor's interpretation of or conclusions drawn from Technical Data or other data, interpretations, opinions, or information.

5.04 Differing Subsurface or Physical Conditions

- A. Notify Construction Manager immediately, but in no event later than 3 days, after becoming aware of a subsurface or physical condition that is uncovered or revealed at the Site, and before further disturbing the subsurface or physical conditions or performing any related Work that:
1. Establishes that the Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. Requires a change in the Drawings or Specifications;
 3. Differs materially from that shown or indicated in the Contract Documents; or
 4. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.
- B. Do not further disturb or perform Work related to this subsurface or physical condition, except in an emergency as required by Paragraph 7.12, until permission do so is issued by Construction Manager.
- C. Construction Manager is to notify OPT after receiving notice of a differing subsurface or physical condition from Contractor. OPT will:
1. Promptly review the subsurface or physical condition;
 2. Determine the necessity of OPT's obtaining additional exploration or tests with respect the subsurface or physical condition;
 3. Determine if the subsurface or physical condition falls within one or more of the differing site condition categories in Paragraph 5.04.A;
 4. Prepare recommendations regarding Contractor's resumption of Work relating to the subsurface or physical condition in question;
 5. Determine the need for changes in the Drawings or Specifications; and

6. Advise Contractor of OPT's findings, conclusions, and recommendations.
- D. Construction Manager is to issue a statement to Contractor regarding the subsurface or physical condition in question and recommend action as appropriate after review of OPT's findings, conclusions, and recommendations. Construction Manager may instruct Contractor to resume Work if OPT determines that the subsurface or physical condition in question has been adequately documented.
- E. Contractor is entitled to an equitable adjustment in Contract Price or Contract Times to the extent that a differing subsurface or physical condition causes a change in Contractor's cost or time to perform the Work provided the condition falls within one or more of the categories described in Paragraph 5.04.A. Any adjustment in Contract Price for Work that is paid for on a unit price basis is subject to the provisions of Paragraph 13.03. Contractor is not entitled to an adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 1. Contractor knew of the existence of the subsurface or physical condition at the time Contractor made an offer to Owner with respect to Contract Price and Contract Times;
 2. The existence of the subsurface or physical condition could have been discovered or revealed by examinations, investigations, explorations, tests, or studies of the Site and contiguous areas expressly required by the Bidding Requirements or Proposal Requirements or the Contract Documents prior to when Contractor's Bid or Proposal is submitted or when Contractor negotiates the Contract Price; or
 3. Contractor failed to give notice as required by Paragraph 5.04.A.
- F. Contractor may submit a Change Proposal no later than 30 days after Construction Manager's issuance of the OPT's statement to Contractor regarding the subsurface or physical condition in question.

5.05 Underground Facilities

- A. The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to OPT by the owners of these Underground Facilities or by others. OPT is not responsible for the accuracy or completeness of information or data provided by others that OPT makes available to Contractor. Contractor is responsible for:
 1. Reviewing and checking available information and data regarding existing Underground Facilities at the Site;
 2. Complying with Laws and Regulations related to locating Underground Facilities before beginning Work;
 3. Locating Underground Facilities shown or indicated in the Contract Documents;
 4. Coordinating the Work with the owners, including Owner, of Underground Facilities during construction; and
 5. The safety and protection of existing Underground Facilities at or adjacent to the Site and repairing damage resulting from the Work.
- B. Notify Construction Manager and the owner of the Underground Facility immediately if an Underground Facility is uncovered or revealed at the Site that was not shown in the

Contract Documents or was not shown with reasonable accuracy in the Contract Documents. Do not further disturb conditions or perform Work affected by this discovery, except in the event of an emergency as required by Paragraph 7.12.

- C. OPT is to take the following action after receiving notice from Construction Manager:
 - 1. Promptly review the Underground Facility to determine if the Underground Facility was shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy;
 - 2. Identify and communicate with the owner of the Underground Facility;
 - 3. Prepare recommendations to OPT regarding Contractor's resumption of Work relating to this Underground Facility;
 - 4. Determine the extent to which a change is required in the Drawings or Specifications to document the consequences of the existence or location of the Underground Facility; and
 - 5. Construction Manager will advise Contractor of OPT's findings, conclusions, and recommendations and provide revised Drawings and Specifications if required.
- D. Construction Manager is to issue a statement to Contractor regarding the Underground Facility in question and recommend action as appropriate after review of OPT's findings, conclusions, and recommendations.
- E. Contractor is entitled to an equitable adjustment in the Contract Price or Contract Times to the extent that the existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy. Any adjustment in Contract Price for Work that is paid for on a unit price basis is subject to the provisions of Paragraph 13.03.
- F. Contractor is not entitled an adjustment in the Contract Price or Contract Times with respect to an existing Underground Facility at the Site if:
 - 1. Contractor knew of the existence of the existing Underground Facility at the Site at the time Contractor made an offer to Owner with respect to Contract Price and Contract Times;
 - 2. The existence of the existing Underground Facility at the Site could have been discovered or revealed by examinations, investigations, explorations, tests, or studies of the Site and contiguous areas expressly required by the Bidding Requirements or Proposal Requirements or the Contract Documents prior to when Contractor's Bid or Proposal is submitted or when Contractor negotiates the Contract Price; or
 - 3. Contractor failed to give notice as required by Paragraph 5.05.B.
- G. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of adjustments in the Contract Price or Contract Times no later than 30 days after Construction Manager's issuance of OPT's statement to Contractor regarding the Underground Facility.

5.06 Hazardous Environmental Conditions at Site

- A. The Supplementary Conditions identify those reports and drawings known to OPT relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and the Technical Data contained in these reports and drawings.
- B. Contractor may rely upon the accuracy of the Technical Data contained in reports and drawings relating to Hazardous Environmental Conditions identified in the Supplementary Conditions, but these reports and drawings are not Contract Documents. Except for the reliance on expressly identified Technical Data, Contractor may not rely upon or make claims against Owner's Indemnitees with respect to:
 - 1. The completeness of these reports and drawings for Contractor's purposes, including aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor or Contractor's safety precautions and programs related to Hazardous Environmental Conditions;
 - 2. Other data, interpretations, opinions, and information contained in these reports or shown or indicated in the drawings; or
 - 3. Any Contractor interpretation of or conclusion drawn from Technical Data or other data, interpretations, opinions, or information.
- C. The results of tests performed on materials described in environmental reports specifically prepared for the Project and made available to Contractor are defined as Technical Data unless Technical Data has been defined more specifically in the Supplementary Conditions.
- D. Contractor is not responsible for removing or remediating Hazardous Environmental Conditions encountered, uncovered, or revealed at the Site unless this removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- E. Contractor is responsible for controlling, containing, and duly removing and remediating Constituents of Concern brought to the Site by Contractor's Team and paying associated costs.
 - 1. Owner may remove and remediate the Hazardous Environmental Condition and impose a Set-off against payments to Contractor for associated costs if Contractor's Team creates a Hazardous Environmental Condition and Contractor does not take acceptable action to remove and remediate the Hazardous Environmental Condition.
 - 2. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER'S INDEMNITEES FROM AND AGAINST ALL CLAIMS AND INDEMNIFIED COSTS ARISING OUT OF OR RELATING TO THE FAILURE TO CONTROL, CONTAIN, OR REMOVE A CONSTITUENT OF CONCERN BROUGHT TO THE SITE BY CONTRACTOR'S TEAM, OR TO A HAZARDOUS ENVIRONMENTAL CONDITION CREATED BY CONTRACTOR'S TEAM. NOTHING IN THIS PARAGRAPH SHALL OBLIGATE CONTRACTOR TO INDEMNIFY ANY INDIVIDUAL OR ENTITY FROM AND AGAINST THE CONSEQUENCES OF THAT INDIVIDUAL'S OR ENTITY'S OWN NEGLIGENCE.**

- F. Immediately notify Construction Manager and take the following action if Contractor uncovers or reveals a Hazardous Environmental Condition at the Site or adjacent areas used by Contractor's Team that was not created by Contractor's Team:
 - 1. Secure or otherwise isolate this condition;
 - 2. Stop Work in affected areas or connected with the condition, except in an emergency as required by Paragraph 7.12; and
 - 3. Do not resume Work relating to the Hazardous Environmental Condition or in affected areas until after OPT has obtained required permits and Construction Manager sends notice to Contractor:
 - a. Specifying that this condition and affected areas are or have been rendered safe for the resumption of Work; or
 - b. Specifying special conditions under which Work may be resumed safely.
 - 4. Owner may order the portion of the Work that is in the area affected by the Hazardous Environmental Condition to be deleted from the Work following the procedures in Article 11 if Contractor does not agree to:
 - a. Resume the Work based on a reasonable belief it is unsafe; or
 - b. Resume the Work under the special conditions provided by Construction Manager.
 - 5. Owner may have this deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- G. Contractor may submit a Change Proposal or Owner may impose a Set-off if an agreement is not reached within 10 days of Construction Manager's notice regarding the resumption of Work as to whether Contractor is entitled to an adjustment in Contract Price or Contract Times or on the amount or extent of adjustments resulting from this Work stoppage or special conditions under which Contractor agrees to resume Work.
- H. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

- A. Furnish a performance bond in an amount equal to the Contract Price as security for the faithful performance of Work. Contractor is to use amounts paid by Owner to Contractor under the Contract for the performance of the Contract. This bond is to remain in effect until 1 year after the date of final payment.
- B. Furnish a payment bond in an amount equal to the Contract Price as security to ensure payment of Contractor's obligations under the Contract Documents. This bond is to remain in effect until 1 year after the date of final payment.
 - 1. Notify Construction Manager of claims filed against the payment bond. Notify the claimant and Construction Manager of undisputed amounts and the basis for

challenging disputed amounts when a claimant has satisfied the conditions prescribed by Laws and Regulations. Promptly pay undisputed amounts.

2. Owner is not liable for payment of costs or expenses of claimants under the payment bond. Owner has no obligations to pay, give notice, or take other action to claimants under the payment bond.
 3. OPT will provide a copy of the payment bond and payment information to Subcontractors, Suppliers, or other persons or entities claiming to have furnished labor or materials used in the performance of the Work that request this information in accordance with Laws and Regulations.
- C. Notify Construction Manager immediately if the surety on bonds furnished by Contractor:
1. Is declared bankrupt, or becomes insolvent;
 2. Has its right to do business in state in which the Project is located is terminated; or
 3. Ceases to meet the requirements of Paragraph 6.02.
- D. Provide a bond and surety which comply with the requirements of Paragraph 6.02 within 20 days after the event giving rise to this notification.
- E. Furnish other bonds as required by the Contract Documents.
- F. Owner may exclude Contractor from the Site and exercise Owner's termination rights under Article 16 if Contractor fails to obtain or maintain required bonds.

6.02 Licensed Sureties

- A. Provide bonds in the form prescribed by the Contract Documents from sureties named in the U.S. Department of the Treasury's Listing of Approved Sureties (Department Circular 570 "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies").
- B. Provide bonds required by the Contract Documents from surety companies that are duly licensed or authorized to provide bonds in the state in which the Project is constructed.

6.03 Insurance - General Provisions

- A. Obtain and maintain insurance with coverage amounts equal to or greater than the amounts specified in Section 00 73 16 "Insurance Requirements" or greater where required by Laws and Regulations.
- B. Obtain insurance from companies that are duly licensed or authorized in the state in which the Project is constructed to issue insurance policies and that have an A.M. Best rating of A-VIII or better.
- C. Deliver evidence of insurance in accordance with Section 00 73 16 "Insurance Requirements" to Owner to demonstrate that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Provide copies of these certificates to Owner and additional insured.
- D. Furnish copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles upon request by Owner or any additional insured. Contractor

may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this paragraph.

- E. OPT's failure to demand such certificates or other evidence of Contractor's full compliance with the insurance requirements or failure to identify a deficiency in compliance from the evidence provided is not a waiver of Contractor's obligation to obtain and maintain the insurance required by the Contract Documents.
- F. Notify Owner if Contractor fails to purchase or maintain the insurance required by the Contract Documents. Do not perform any Work on the Project unless the required insurance policies are in effect. Owner may exclude Contractor from the Site and exercise Owner's termination rights under Article 16 if Contractor fails to obtain or maintain the required insurance.
- G. Owner may elect to obtain equivalent insurance to protect Owner's interests without prejudice to any other right or remedy if Contractor fails to obtain or maintain the required insurance. Owner may impose a reasonable Set-off against payments due under Article 15 to recover the cost of the insurance.
- H. Owner does not represent that the insurance coverage and limits established in this Contract are adequate to protect Contractor or Contractor's interests.
- I. The required insurance and insurance limits do not limit Contractor's liability under the indemnities granted to Owner's Indemnitees in the Contract Documents.
- J. Provide for an endorsement that the "other insurance" clause will not apply to OPT where OPT is an additional insured shown on the policy. Contractor's insurance is primary and non-contributory with respect to any insurance or self-insurance carried by OPT for liability arising out of operations under this Agreement.
- K. Include and list OPT and any other individuals or entities identified in the Section 00 73 16 "Insurance Requirements" as additional insureds on all policies except for the workers' compensation policy and Contractor's professional liability policy.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 Contractor's Means and Methods of Construction

- A. Contractor is solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. Provide professional engineering or other design services if the Contract Documents require such services or if Contractor determines that such services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety. Engineering or other design services are to be provided by a properly licensed design professional authorized to provide these services in the state in which the Project is constructed. Such services are not Owner-delegated professional design services under this Contract, and OPT does not have any responsibility with respect to:
 - 1. Contractor's determination of the need for such services;

2. The qualifications or licensing of the design professionals retained or employed by Contractor;
3. The performance of such services; or
4. Any errors, omissions, or defects in such services.

7.02 Supervision and Superintendence

- A. Supervise, inspect, and direct the performance of the Work.
- B. Provide a competent resident superintendent acceptable to OPT. The resident superintendent or acceptable qualified assistant is to always be present when Work is being done. Do not replace this resident superintendent except under extraordinary circumstances. Provide a replacement resident superintendent equally competent to the previous resident superintendent if replacement is required. Notify Owner prior to replacing the resident superintendent and obtain Owner's consent to the change in superintendent.

7.03 Labor; Working Hours

- A. Provide competent, suitably qualified personnel to complete the Work. Maintain good discipline and order at the Site. Contractor is responsible for all acts and omissions of Contractor's Team.
- B. Perform Work at the Site during regular working hours except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent to the Site and except as otherwise stated in the Contract Documents.
- C. Do not perform Work on a Saturday, Sunday, or Owner-observed holiday without Construction Manager's consent. If a legal holiday falls on a Saturday, it will be observed the preceding Friday. If a legal holiday falls on a Sunday, it will be observed the following Monday.
- D. Pay additional cost incurred by Owner for services of Construction Manager to observe Work constructed outside of regular working hours. Construction Manager will issue a Set-off in the Application for Payment for this cost per Paragraph 15.01.B.

7.04 Services, Materials, and Equipment

- A. Provide services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and other facilities and incidentals necessary for the performance, testing, startup, and completion of the Work, whether or not these items are specifically called for in the Contract Documents.
- B. Provide new materials and equipment to be incorporated into the Work. Provide special warranties and guarantees required by the Contract Document. Provide satisfactory evidence, including reports of required tests, as to the source, kind, and quality of materials and equipment as required by the Contract Documents or as requested by Construction Manager.

- C. Store, apply, install, connect, erect, protect, use, clean, and condition materials and equipment in accordance with instructions of the applicable Supplier, unless otherwise required by the Contract Documents.

7.05 Concerning Subcontractors, and Suppliers

- A. Contractor may retain Subcontractors and Suppliers which are acceptable to Owner for the performance of parts of the Work. Contractor must retain specific Subcontractors or Suppliers if required to do so by the Contract Documents. Contractor must use Subcontractors or Suppliers named in the Bid or Proposal if Contractor was selected in part based on these named Subcontractors or Suppliers.
- B. Submit a list of proposed Subcontractors and Suppliers to Construction Manager prior to entering into binding subcontracts or purchase orders. These proposed Subcontractors or Suppliers are deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 10 days after receiving this list.
- C. Owner may require the replacement of Subcontractors or Suppliers retained by Contractor. Provide an acceptable replacement for the rejected Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements, subject to Contractor's reasonable objections.
- D. Contractor may be entitled to an adjustment in Contract Price or Contract Times with respect to a replacement of Subcontractors or Suppliers required by Owner. Notify Construction Manager immediately if a replacement of Subcontractors or Suppliers increases the Contract Price or Contract Times. Initiate a Change Proposal for the adjustment within 10 days of Owner's notice to replace a Subcontractor or Supplier. Do not make the replacement until the change in Contract Price or Contract Times has been accepted by Owner if Change Proposal is to be submitted. Contractor is not entitled to an adjustment in Contract Price or Contract Times if OPT requires the replacement of the Subcontractor or Supplier based on an unacceptable safety record, lack of experience or qualifications, or other cause.
- E. Acceptance by Owner of Subcontractors, Suppliers, or other individuals or entities, whether initially or as a replacement, does not constitute a waiver of the obligation of Contractor to complete the Work in accordance with the Contract Documents.
- F. Maintain a current and complete list of Subcontractors and Suppliers that are to perform or furnish part of the Work.
- G. Contractor is fully responsible for the acts and omissions of Subcontractors and Suppliers and is solely responsible for scheduling and coordinating their Work.
- H. Require Subcontractors, Suppliers, and other individuals or entities performing or furnishing Work to communicate with OPT through Contractor.
- I. Contracts between Contractor and their Subcontractors or Suppliers may specifically bind the Subcontractors or Suppliers to the applicable terms and conditions of the Contract Documents. Contractor is responsible for meeting the requirements of the Contract Documents if they choose to not bind the Subcontractors or Suppliers to applicable terms or conditions of the Contract Documents.

- J. OPT may furnish information about amounts paid to Contractor for Work provided by Subcontractors or Suppliers to the entity providing the Work.
- K. Nothing in the Contract Documents:
 - 1. Creates a contractual relationship between members of OPT and members of Contractor's Team; or
 - 2. Creates an obligation on the part of Owner to pay or to see to the payment of money due members of Contractor's Team, except as may be required by Laws and Regulations.

7.06 Patent Fees and Royalties

- A. Pay license fees, royalties, and costs incident to the use of inventions, designs, processes, products, or devices which are patented or copyrighted by others in the performance of the Work, or to incorporate these inventions, designs, processes, products, or devices which are patented or copyrighted by others in the Work. The Contract Documents identify inventions, designs, processes, products, or devices OPT knows are patented or copyrighted by others, or that its use is subject to patent rights or copyrights calling for the payment of a license fee or royalty to others. Contractor is to include the cost associated with the use of patented or copyrighted products or processes, whether specified or selected by Contractor, in the Contract Price.
- B. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER'S INDEMNITEES FROM AND AGAINST ALL CLAIMS AND INDEMNIFIED COSTS ARISING OUT OF OR RELATING TO ANY INFRINGEMENT OF PATENT RIGHTS OR COPYRIGHTS BY CONTRACTOR'S TEAM INCIDENT TO THE USE IN THE PERFORMANCE OF THE WORK OR RESULTING FROM THE INCORPORATION IN THE WORK OF ANY INVENTION, DESIGN, PROCESS, PRODUCT, OR DEVICE.**

7.07 Permits

- A. Obtain and pay for construction permits and licenses, and certificates of occupancy, if required. OPT is to assist Contractor in obtaining permits and licenses when required to do so by applicable Laws and Regulations. Pay governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time the Contractor's Bid or Proposal is submitted or when Contractor negotiates the Contract Price.

7.08 Taxes

- A. Contractor is responsible for all taxes and duties arising out of the Work. Contractor is responsible for including in the Contract Price any applicable sales and use taxes and is responsible for complying with all applicable Laws and Regulations. Pay sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations.

7.09 Laws and Regulations

- A. Give required notices and comply with Laws and Regulations applicable to the performance of the Work. OPT is not responsible for monitoring Contractor's compliance with Laws or Regulations except where expressly required by applicable Laws and Regulations.

- B. Pay costs resulting from actions taken by Contractor that are contrary to Laws or Regulations. Contractor is not responsible for determining that the design aspects of the Work described in the Contract Documents is in accordance with Laws and Regulations. This does not relieve Contractor of its obligations under Paragraph 3.03.
- C. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER'S INDEMNITEES HARMLESS FROM ALL CLAIMS AND INDEMNIFIED COSTS RESULTING FROM ACTIONS TAKEN BY CONTRACTOR'S TEAM THAT ARE CONTRARY TO LAWS OR REGULATIONS.**
- D. Owner or Contractor may give notice to the other party of changes in Laws or Regulations that may affect the cost or time of performance of the Work, including:
 - 1. Changes in Laws or Regulations affecting procurement of permits; and
 - 2. Sales, use, value-added, consumption, and other similar taxes which come into effect after Contractor's Bid or Proposal is submitted or when Contractor negotiates the Contract Price.
- E. Contractor may submit a Change Proposal or Owner may initiate a Claim within 30 days of this notice if Owner and Contractor are unable to agree on entitlement to or on the amount or extent of adjustments in Contract Price or Contract Times resulting from these changes.

7.10 Safety and Protection

- A. Contractor is solely responsible for initiating, maintaining, and supervising safety precautions and programs relating to the Work. This responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their Work, nor for compliance with applicable safety Laws and Regulations.
- B. Take necessary precautions for the safety of persons on the Site or who may be affected by the Work, and provide the necessary protection to prevent damage, injury, or loss to:
 - 1. Work and materials and equipment to be incorporated in the Work, whether stored on or off the Site; and
 - 2. Other property at or adjacent to the Site, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement during construction.
- C. Comply with applicable Laws and Regulations relating to the safety and protection of persons or property. Erect and maintain necessary safeguards for safety and protection. Notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site when prosecution of the Work may affect them. Cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- D. Remedy damage, injury, or loss to property referred to in Paragraph 7.10.B caused by Contractor's Team. Pay remediation costs unless the damage or loss is:
 - 1. Attributable to the fault of the Contract Documents;
 - 2. Attributable to acts or omissions of OPT; or

- 3. Not attributable to the actions or failure to act of Contractor's Team.
- E. Contractor's duties and responsibilities for safety and protection of persons or the Work or property at or adjacent to the Site continues until Work is completed and resumes whenever Contractor's Team returns to the Site to fulfill warranty or correction obligations or to conduct other tasks.
- F. Comply with the applicable requirements of the Owner's safety program if required to do so in the Supplementary Conditions. A copy of the Owner's safety program will be provided in the Bidding Documents or Proposal Documents.
- G. Provide a qualified and experienced safety representative at the Site whose duties and responsibilities are the prevention of accidents and maintaining and supervising safety programs.

7.11 Hazard Communication Programs

- A. Coordinate the exchange of safety data sheets or other hazard communication information required to be made available or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.12 Emergencies

- A. Act to prevent threatened damage, injury, or loss in emergencies affecting the safety or protection of persons or the Work or property at or adjacent to the Site. Notify Construction Manager immediately if Contractor believes that significant changes in the Work or variations from the Contract Documents have been caused or are required because of this need to act. A Modification is to be issued by Construction Manager if OPT determines that the incident giving rise to the emergency action was not the responsibility of Contractor and that a change in the Contract Documents is required because of the action taken by Contractor in response to this emergency.

7.13 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that Work is in accordance with the Contract Documents and is not Defective. Owner is entitled to rely on Contractor's warranty and guarantee. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 7.14. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.13 is limited only by applicable Laws and Regulations restricting actions to enforce such rights. Assume and bear responsibility for costs and time delays associated with variations from the requirements of the Contract Documents.
- B. This Contractor's warranty and guarantee excludes defects or damage caused by abuse, improper maintenance or operation, or modification by OPT; or normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete Work in accordance with the Contract Documents is absolute. None of the following constitute an acceptance of Defective Work,

a release of Contractor's obligation to perform Work in accordance with the Contract Documents or a release of Owner's warranty or guarantee rights under this Paragraph:

1. Observations by OPT;
 2. Recommendation by Construction Manager or payment by Owner of progress or final payments;
 3. The issuance of a certificate of Substantial Completion;
 4. The issuance of a certificate of Final Completion;
 5. The end of the correction period established in Paragraph 7.14;
 6. Use or occupancy of part of the Work by Owner;
 7. Review and approval of a Shop Drawing or Sample;
 8. Inspections, tests, or approvals by others; or
 9. Correction of Defective Work by Owner.
- D. The Contract Documents may require Contractor to accept the assignment of a contract between the Owner and a contractor or supplier. The specific warranties, guarantees, and correction obligations contained in an assigned contract govern with respect to Contractor's performance obligations to Owner for the Work described in an assigned contract.

7.14 Correction Period

- A. Promptly correct Defective Work without cost to Owner for 1 year after the date of Substantial Completion or longer periods of time prescribed by the terms of the Contract Documents.
- B. Promptly correct damages to the Site or adjacent areas that Contractor has arranged to use through construction easements or other agreements. Promptly correct damages to Work or the work of others. Make corrections without cost to Owner.
- C. Owner may have the Defective Work and damages described in Paragraphs 7.14.A and 7.14.B corrected if Contractor does not comply with the terms of Construction Manager's instructions, or in an emergency where delay would cause serious risk of loss or damage.
- D. **NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT OR THE CONTRACT DOCUMENTS AND TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER'S INDEMNITEES HARMLESS FROM AND AGAINST ALL CLAIMS AND INDEMNIFIED COSTS ARISING OUT OF OR RELATING TO THE CORRECTION OF DEFECTIVE WORK.**
- E. The correction period starts to run from the date when a specific item of equipment or systems are placed in continuous beneficial use by Owner before Substantial Completion of Work if so provided in the Specifications or if accepted for beneficial use by Owner.
- F. The correction period is extended for an additional period of 1 year for Defective Work corrected after the date of Substantial Completion or after the accepted date the correction period starts to run as described in Paragraph 7.14.E. This extended correction

period starts to run when Defective Work has been satisfactorily corrected under this Paragraph 7.14.

- G. Contractor's obligations under this Paragraph 7.14 are in addition to other obligations or warranties. The provisions of this Paragraph 7.14 are not a substitute for, or a waiver of, the provisions of applicable statutes of limitation or repose.

7.15 Indemnification

- A. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, AND IN ADDITION TO ANY OTHER OBLIGATIONS OF CONTRACTOR UNDER THE CONTRACT OR OTHERWISE, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER'S INDEMNITEES FROM AND AGAINST ALL CLAIMS AND INDEMNIFIED COSTS ARISING OUT OF OR RELATING TO THE PERFORMANCE OF THE WORK, PROVIDED THAT ANY SUCH CLAIM, ACTION, LOSS, OR DAMAGE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE, OR DEATH, OR TO DAMAGE TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF), INCLUDING THE LOSS OF USE RESULTING THEREFROM BUT ONLY TO THE EXTENT CAUSED BY ANY NEGLIGENT ACT OR OMISSION OF CONTRACTOR'S TEAM.**
- B. The indemnification obligation under Paragraph 7.15.A is not limited by the amount or type of damages, compensation, or benefits payable by or for members of Contractor's Team or other individuals or entities under workers' compensation acts, disability benefit acts, or other employee benefit acts in claims against Owner's Indemnitees by an employee or the survivor or personal representative of employee of Contractor's Team.

7.16 Delegation of Professional Design Services

- A. Contractor is to provide professional design services required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures.
- B. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. This delegation will specify the performance and design criteria that such services must satisfy and the Submittals that Contractor must furnish to Construction Manager with respect to Owner delegated design. Contractor is not required to provide these professional services in violation of applicable Laws and Regulations.
- C. Owner-delegated professional design services provided through Contractor are to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and other Submittals prepared by such design professional. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Construction Manager, then such Shop Drawing or other Submittal must bear the design professional's written approval when submitted by Contractor to Construction Manager.
- D. OPT is entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by Contractor's design professionals, provided OPT has specified to Contractor the performance and design criteria that these services must satisfy.

- E. Pursuant to this Paragraph 7.16, OPT's review and approval of design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this paragraph;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor is not responsible for the adequacy of the performance or design criteria specified by OPT. Advise OPT if the performance or design criteria are known or considered likely to be inadequate or otherwise deficient.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 Other Work

- A. Owner may arrange for other work at or adjacent to the Site which is not part of the Contractor's Work. This other work may be performed by Owner's employees or through other contractors. Utility owners may perform work on their utilities and facilities at or adjacent to the Site. Include costs associated with coordinating with entities performing other work or associated with connecting to this other work in the Contract Price if this other work is shown in the Contract Documents.
- B. OPT is to notify Contractor of other work prior to starting the work and provide any knowledge they have regarding the start of utility work at or adjacent to the Site to Contractor.
- C. Provide other contractors:
 - 1. Proper and safe access to the Site;
 - 2. Reasonable opportunity for the introduction and storage of materials and equipment; and
 - 3. Reasonable opportunity to execute their work.
- D. Provide cutting, fitting, and patching of the Work required to properly connect or integrate with other work. Do not endanger the work of others by cutting, excavating, or otherwise altering the work of others without the consent of Construction Manager and the others whose work will be affected.
- E. Inspect the work of others and immediately notify Construction Manager if the proper execution of part of Contractor's Work depends upon work performed by others and this work has not been performed or is unsuitable for the proper execution of Contractor's Work. Contractor's failure to notify Construction Manager constitutes an acceptance of this other work as acceptable for integration with Contractor's Work. This acceptance does not apply to latent defects or deficiencies in the work of others.
- F. Take adequate measures to prevent damages, delays, disruptions, or interference with the work of Owner, other contractors, or utility owners performing other work at or adjacent to the Site.

- G. The provisions of this Article 8 are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.03.

8.02 Coordination

- A. Owner has sole authority and responsibility for coordination of this other work unless otherwise provided in the Contract Documents. Owner is to identify the entity with authority and responsibility for coordination of the activities of the various contractors, the limitations of their authority, and the work to be coordinated prior to the start of other work at or adjacent to the Site.

8.03 Legal Relationships

- A. Contractor may be entitled to a change in Contract Price or Contract Times if, while performing other work at or adjacent to the Site for Owner, the OPT, other contractor, or utility owner:
 - 1. Damages the Work or property of Contractor's Team;
 - 2. Delays, disrupts, or interferes with the execution of the Work; or
 - 3. Increases the scope or cost of performing the Work through their actions or inaction.
- B. Notify Construction Manager immediately of the event leading to a potential Change Proposal so corrective or mitigating action can be taken. Submit the Change Proposal within 30 days of the event if corrective action has not adequately mitigated the impact of the actions or inactions of others. Information regarding this other work in the Contract Documents is used to determine if Contractor is entitled to a change in Contract Price or Contract Times. Changes in Contract Price require that Contractor assign rights against the other contractor or utility owner to Owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Changes in Contract Times require that the time extension is essential to Contractor's ability to complete the Work within the Contract Times.
- C. Take prompt corrective action if Contractor's Team damages, delays, disrupts, or interferes with the work of Owner's employees, other contractors, or utility owners performing other work at or adjacent to the Site or agree to compensate other contractors or utility owners for correcting the damage. Promptly attempt to settle claims with other contractors or utility owners if Contractor damages, delays, disrupts, or interferes with the work of other contractors or utility owners performing other work at or adjacent to the Site.
- D. Owner may impose a Set-off against payments due to Contractor and assign the Owner's contractual rights against Contractor with respect to the breach of the obligations described in this Paragraph 8.03 to other contractors or utility owners if damages, delays, disruptions, or interference occur.
- E. **NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT OR THE CONTRACT DOCUMENTS AND TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER'S INDEMNITEES**

HARMLESS FROM AND AGAINST ALL CLAIMS AND INDEMNIFIED COSTS RESULTING FROM CONTRACTOR'S TEAM'S ACTION OR INACTION RELATED TO DAMAGES, DELAYS, DISRUPTIONS, OR INTERFERENCE WITH THE WORK OF OWNER'S EMPLOYEES, OTHER CONTRACTORS, OR UTILITY OWNERS PERFORMING OTHER WORK AT OR ADJACENT TO THE SITE.

ARTICLE 9 – OWNER'S AND OPT'S RESPONSIBILITIES

9.01 Communications to Contractor

- A. OPT issues communications to Contractor through Construction Manager except as otherwise provided in the Contract Documents.

9.02 Replacement of Owner's Project Team Members

- A. Owner may replace members of OPT at its discretion.

9.03 Furnish Data

- A. OPT is to furnish the data required of OPT under the Contract Documents.

9.04 Pay When Due

- A. Owner is to make payments to Contractor when due as described in Article 15.

9.05 Lands and Easements; Reports and Tests

- A. Owner's duties with respect to providing lands and easements are described in Paragraph 5.01. OPT will make copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site available to Contractor in accordance with Paragraph 5.03.

9.06 Insurance

- A. Owner's responsibilities with respect to purchasing and maintaining insurance are described in Article 6.

9.07 Modifications

- A. Owner's responsibilities with respect to Modifications are described in Article 11.

9.08 Inspections, Tests, and Approvals

- A. OPT's responsibility with respect to certain inspections, tests, and approvals are described in Paragraph 14.02.

9.09 Limitations on OPT's Responsibilities

- A. OPT does not supervise, direct, or have control or authority over, and is not responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or related safety precautions and programs, or for failure of Contractor to comply with Laws

and Regulations applicable to the performance of the Work. OPT is not responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- B. OPT is not responsible for the acts or omissions of Contractor's Team. No actions or failure to act, or decisions made in good faith to exercise or not exercise the authority or responsibility available under the Contract Documents creates a duty in contract, tort, or otherwise of OPT to the Contractor or members of Contractor's Team.

9.10 Undisclosed Hazardous Environmental Condition

- A. OPT's responsibility for undisclosed Hazardous Environmental Conditions is described in Paragraph 5.06.

9.11 Compliance with Safety Program

- A. Contractor is to inform OPT of its safety programs and OPT is to comply with the specific applicable requirements of this program.

ARTICLE 10 – DESIGN PROFESSIONAL'S AND CONSTRUCTION MANAGER'S STATUS DURING CONSTRUCTION

10.01 Owner's Representative

- A. Construction Manager is Owner's representative. The duties and responsibilities and the limitations of authority of Construction Manager as Owner's representative are described in the Contract Documents.

10.02 Visits to Site

- A. Design Professional is to make periodic visits to the Site to observe the progress and quality of the Work. Design Professional is to determine, in general, if the Work is proceeding in accordance with the Contract Documents based on observations made during these visits. Design Professional is not required to make exhaustive or continuous inspections to check the quality or quantity of the Work. Design Professional is to inform OPT of issues or concerns and Construction Manager is to work with Contractor to address these issues or concerns. Design Professional's visits and observations are subject to the limitations on Design Professional's authority and responsibility described in the Contract Documents.
- B. Construction Manager is to observe the Work to check the quality and quantity of Work, implement Owner's quality assurance program and administer the Contract as Owner's representative as described in the Contract Documents. Construction Manager's visits and observations are subject to the limitations on Construction Manager's authority and responsibility described in the Contract Documents.

10.03 Rejecting Defective Work

- A. OPT has the authority to reject Work in accordance with Article 14. Construction Manager is to notify Contractor of Defective Work of which it is aware and document when Defective Work has been corrected or accepted in accordance with Article 14.

10.04 Decisions on Requirements of Contract Documents and Acceptability of Work

- A. Construction Manager is to render decisions regarding non-technical or contractual/administrative requirements of the Contract Documents and will coordinate the response of OPT to Contractor.
- B. Design Professional is to render decisions regarding the conformance of the Work to the requirements of the Contract Documents. Design Professional will render a decision to either correct the Defective Work, or accept the Work under the provisions of Paragraph 14.04, if Work does not conform to the Contract Documents. Construction Manager will coordinate the response of OPT to Contractor.
- C. Construction Manager will issue a Request for a Change Proposal if a Modification is required. Construction Manager will provide documentation for changes related to the non-technical or contractual/administrative requirements of the Contract Documents. Design Professional will provide documentation if design related changes are required through Construction Manager.
- D. Contractor may appeal OPT's decision by submitting a Change Proposal if Contractor does not agree with the OPT's decision.

ARTICLE 11 – CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract Documents

- A. A Contract Amendment, Change Order, Work Change Directive, or Field Order may modify the Contract Documents. Modifications that include a change in the Contract Price or Contract Times can only be made in a Contract Amendment or Change Order.
- B. Changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other design or technical matters, must be supported by Design Professional's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of Design Professional.
- C. Proceed with the Changes in the Work or, in the case of a deletion in the Work, immediately cease construction activities related to the deleted Work upon receipt of the Modification.
- D. Contractor is not entitled to an increase in the Contract Price or an extension of the Contract Times with respect to Work performed that is not required by the Contract Documents, except in the case of an emergency as provided in Paragraph 7.12, or in the case of uncovering Work as provided in Paragraph 14.05. Contractor is responsible for costs and time delays associated with variations from the requirements of the Contract Documents unless the variations are specifically approved by Change Order.
- E. Acceptance of a Modification by Contractor constitutes agreement that the compensation provided by that Modification is the full, complete, and final compensation for all costs Contractor has or may incur because of or relating to this Modification whether these costs are known, unknown, foreseen, or unforeseen at this time, including any cost for delay, extended overhead, ripple or impact cost, or any other effect on changed or unchanged Work as a result of this Modification.

- F. Acceptance of a Modification by Contractor constitutes agreement that the changes in Contract Times are the complete and final adjustments for direct impacts to the ability of Contractor to complete the Work within the Contract Times and are the only adjustments to which Contractor is entitled.
- G. Perform added or revised Work under the applicable provisions of the Contract Documents for the same or similar Work unless different Drawings, Specifications, or directions are provided in the Modification.
- H. Nothing in this paragraph obligates Contractor to undertake Work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.02 Contract Amendments

- A. Owner and Contractor may modify the terms and conditions of the Contract Documents without the recommendation of Design Professional using a Contract Amendment.
- B. A Contract Amendment may also be used for authorizing a new task order for task order contracts or a new phase of the Work when using phased construction or purchasing Goods and Special Services to be incorporated into the Project. The Contract Amendment may be used to establish the Contract Price, Contract Times, or terms and conditions of the Contract for the new task order or phase of Work if not already established in the Contract Documents.

11.03 Change Orders

- A. All changes to the Contract Documents that include a change in the Contract Price or the Contract Times for previously authorized Work and changes to the Work requiring Design Professional's approval must be made by a Change Order. Change Orders prepared by Construction Manager may cover:
 - 1. Changes in Contract Price or Contract Times which are submitted by Contractor as a Change Proposal and agreed to by the parties;
 - 2. Changes in Contract Price or Contract Times to pay for undisputed Work performed in accordance with a Work Change Directive;
 - 3. Changes in Contract Price or Contract Times making final adjustments for Work covered under Alternates and Allowances;
 - 4. Changes in Contract Price or Contract Times making final adjustments to actual quantities for Unit Price Work;
 - 5. Changes in Contract Price resulting from an Owner Set-off, unless the set off has been successfully challenged by Contractor;
 - 6. Changes in Contract Price or Contract Times resulting from resolution of Claims;
 - 7. Changes in Contract Price or Contract Times required because of Owner's acceptance of Defective Work under Paragraph 14.04 or Owner's correction of Defective Work under Paragraph 14.07; or
 - 8. Other similar provisions that will modify the Contract Price or Contract Times.

- B. A Change Order may also be used to establish modifications of the Contract Documents that do not affect the Contract Price or Contract Times.

11.04 Work Change Directives

- A. A Work Change Directive does not change the Contract Price or the Contract Times, but is evidence that the parties expect that the modifications ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations on the Contract Price and Contract Times.
- B. Contractor must submit a Change Proposal seeking an adjustment of the Contract Price or the Contract Times no later than 30 days after the completion of the Work set out in the Work Change Directive if negotiations are unsuccessful under the terms of the Contract Documents governing adjustments.

11.05 Field Orders

- A. Design Professional may require minor changes in the Work that do not change the Contract Price or Contract Times using a Field Order through Construction Manager. Construction Manager may issue a Field Order for non-technical, administrative issues. Submit a Change Proposal if Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times before proceeding with the Work described in the Field Order.

11.06 Change Proposals

- A. Submit a Change Proposal to Construction Manager to:
 - 1. Request an adjustment in the Contract Price or Contract Times;
 - 2. Contest an initial decision by OPT concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents;
 - 3. Contest a Set-off against payment due; or
 - 4. Seek other relief under the Contract Documents.
- B. Notify Construction Manager immediately if a Change Proposal is to be submitted. Submit each Change Proposal to Construction Manager no later than 30 days after the event initiating the Change Proposal. Submit the following as part of the Change Proposal:
 - 1. Any proposed change in Contract Price, Contract Times, or other relief, accompanied by a statement that the requested Change Order is the entire adjustment to which Contractor believes it is entitled;
 - 2. The reason for the proposed change; and
 - 3. Supporting data, accompanied by a statement that the supporting data is accurate and complete.
- C. Construction Manager is to advise OPT regarding the Change Proposal. OPT is to review each Change Proposal and Contractor's supporting data, and within 30 days after receipt of the documents, direct Construction Manager to either approve or deny the Change Proposal in whole or in part. Construction Manager is to issue a Change Order for an approved Change Proposal. Change Proposals are denied if Construction Manager does not

act on the Change Proposal within 30 days. Contractor may start the time for appeal of the denial under Article 12.

11.07 Change of Contract Price; Contract Times

- A. Change Proposals for an adjustment in the Contract Price must comply with the provisions of this Paragraph 11.07. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12. Any adjustment of the Contract Times is subject to the limitations described in Paragraph 4.03.
- B. An adjustment in the Contract Price is to be determined as follows:
 - 1. By applying unit prices to the quantities of the items involved, subject to the provisions of Paragraph 13.03, where the Work involved is covered by unit prices in the Contract Documents;
 - 2. By a mutually agreed lump sum where the Work involved is not covered by unit prices in the Contract Documents; or
 - 3. Payment based on the Cost of the Work determined as provided in Article 13 when the Work involved is not covered by unit prices in the Contract Documents or the parties do not reach a mutual agreement to a lump sum.
- C. The original Contract Price may not be increased by more than 25 percent unless further limited by Laws and Regulations. Owner may decrease the Work by up to 25 percent of the Contract Price without adjusting Contractor's fee.

11.08 Execution of Change Orders and Contract Amendments

- A. Each Change Order or Contract Amendment must be specific and final as to changes in Contract Price and Contract Times for the changes described in the Change Order or Contract Amendment. Acceptance of a Change Order or Contract Amendment by Contractor constitutes a full accord and satisfaction for all claims and costs of any kind, whether direct or indirect, including impact, delay, or acceleration damages related to the Change Order or Contract Amendment. The execution of a Change Order or Contract Amendment by Contractor constitutes conclusive evidence of Contractor's agreement to the ordered changes in the Work, with no reservations or other provisions allowing for future changes in the Contract Price or Contract Times. This Contract, as amended, forever releases any claim against Owner for additional time or compensation for matters relating to or arising out of or resulting from the Work included within or affected by the executed Change Order or Contract Amendment. This release applies to claims related to the cumulative impact of all Change Orders or Contract Amendment and to any claim related to the effect of a change on unchanged Work.
- B. A Change Order or Contract Amendment is deemed to be in full force as if executed by Contractor if Contractor refuses to execute a Change Order or Contract Amendment that is required to be executed under the terms of this Paragraph 11.08.

11.09 Notice to Surety

- A. Notify the surety of Modifications affecting the general scope of the Work, changes in the provisions of the Contract Documents, or changes in Contract Price or Contract Times. Adjust the amount of each bond when Modifications change the Contract Price.

ARTICLE 12 – CLAIMS

12.01 Claims

- A. Follow the Claims process described in this Article for a demand or assertion by Contractor:
 - 1. Contesting an initial decision by OPT concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents;
 - 2. Contesting OPT's decision regarding a Change Proposal;
 - 3. Seeking resolution of a contractual issue that OPT has declined to address;
 - 4. Seeking other relief with respect to the terms of the Contract; or
 - 5. Any issue, request, demand, or dispute arising after Construction Manager's recommendation of Final Payment not specifically listed in the Certificate of Final Completion.
- B. Notify Construction Manager no later than 7 days after the start of the event giving rise to the Claim or, in the case of appeals regarding Change Proposals, within 7 days of the decision under appeal. The responsibility to substantiate a Claim rests with the entity making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Price or Contract Times, Contractor must certify that the Claim is made in good faith, that the supporting data is accurate and complete, and that to the best of Contractor's knowledge and belief, the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. The entity receiving a Claim is to review the Claim and consider its merits. The Owner and Contractor are to seek to resolve the Claim through the exchange of information and direct negotiations. The Owner and Contractor may extend the time for resolving the Claim by mutual agreement. Notify Construction Manager of actions taken on a Claim.
- D. Owner and Contractor may mutually agree to mediate the underlying dispute at any time after initiation of a Claim.
 - 1. The agreement to mediate suspends the Claims process.
 - 2. Owner or Contractor may unilaterally terminate the mediation process after 60 days from the agreement to mediate and resume the Claims process as of the date of the termination. The Claim process resumes as of the date of the conclusion of the mediation, as determined by the mediator, if the mediation is unsuccessful in resolving the dispute.
 - 3. Owner and Contractor are to each pay one-half of the mediator's fees and costs.
- E. If the entity receiving a Claim approves the Claim in part or denies it in part, this action is final and binding unless the other entity invokes the procedure described in Article 17 for final resolution of disputes within 30 days of this action.

- F. Notify Construction Manager if efforts to resolve the Claim are not successful and the Claim is denied. A denial of the Claim is final and binding unless the other entity invokes the procedure described in Article 17 for the final resolution of disputes within 30 days of the denial.
- G. The results of the agreement or action on the Claim is to be incorporated in a Change Order by Construction Manager to the extent they affect the Contract Documents, the Contract Price, or the Contract Times if the Owner and Contractor reach an agreement regarding a Claim.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. The Cost of the Work is the sum of costs described in this Paragraph 13.01, except those excluded in Paragraph 13.01.D, necessary for the proper performance of the Work. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price under cost-plus, time-and-materials, or other cost-based terms; or
 - 2. To determine the value of a Change Order, Change Proposal, Claim, Set-off, or other adjustment in Contract Price.
- B. Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the events giving rise to the adjustment when the value of the adjustment is determined on the basis of the Cost of the Work.
- C. Costs included in the Cost of the Work may not exceed the costs commonly incurred in the proximate area of the Site for similar work unless agreed to by Owner. Cost of the Work includes only the following items:
 - 1. Payroll costs for Contractor's employees performing the Work, including one foreman per crew, and other required and agreed upon personnel for the time they are employed on the Work. Employees are to be paid according to wage rates for job classifications as agreed to by Owner in advance of the Work. Rates paid for this Work are to be the same as paid for Contract Work as established by certified payroll. Payroll costs may include:
 - a. Actual costs paid for salaries and wages;
 - b. Actual cost paid for fringe benefits, which consists of:
 - 1) Social security contributions,
 - 2) Unemployment,
 - 3) Excise and payroll taxes,
 - 4) Workers' compensation,
 - 5) Health and retirement benefits, and
 - 6) Paid time off for sick leave, vacations and holidays; and

- c. Actual cost of additional compensation paid for performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, to the extent authorized by Owner.
- 2. Cost of materials and equipment furnished and incorporated in the Work, including transportation and storage costs and required Suppliers' field services. Contractor may retain cash discounts unless Owner provided funds to Contractor for early payment of these materials and equipment. Cash discounts are to be credited to Owner if Owner provides funds for early payment. Make provisions for trade discounts, rebates, refunds, and returns from sale of surplus materials and equipment and reduce the Cost of the Work by these amounts.
- 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. Obtain competitive bids from Subcontractors acceptable to Owner if required by OPT. Bids are to be opened in the presence of Construction Manager and other designated members for OPT. Provide copies of bids to Construction Manager to use in determining, with OPT, which bids are acceptable. The Subcontractor's Cost of the Work and fee are determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01 if the subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee.
- 4. Supplemental costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work;
 - b. Costs of materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site including transportation and maintenance costs related specifically to the Work;
 - c. Costs of engineers, architects, testing laboratories, surveyors, employed or retained for services specifically related to the Work.
 - d. Actual cost for construction equipment, including the costs of transporting, loading, unloading, assembling, dismantling, and removing construction equipment, whether owned by Contractor or rented from others.
 - 1) Cost for construction equipment must not exceed the cost shown in the most current edition of the rental rate book named in the Supplemental Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 2) With respect to Work that is the result of a Change Order, Change Proposal, Claim, Set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

- e. Applicable sales, consumer, use, and other similar taxes related to the Work for which Owner is not exempt, and which Contractor pays consistent with Laws and Regulations;
 - f. Deposits lost for causes other than negligence of Contractor's Team;
 - g. Royalty payments and fees for permits and licenses;
 - h. Cost of additional utilities, fuel, and sanitary facilities at the Site;
 - i. Minor expense items directly required by the Work; and
 - j. Premiums for bonds and insurance required by the Contract Documents.
- D. The Cost of the Work does not include the following administrative costs which are to be covered by the Contractor's fee:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, safety managers, superintendents, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office, for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.C.1.
 - 2. The cost of purchasing, renting or furnishing any tool or equipment whose current price would be less than \$500 if purchased new at retail.
 - 3. Office expenses other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. Costs due to the actions of Contractor's Team for the correction of Defective Work, disposal of materials or equipment that do not comply with Specifications, and correcting damage to property.
 - 6. Losses, damages, and related expenses caused by damage to the Work or sustained by Contractor in connection with the performance of the Work. Contractor is entitled to recover costs if covered by Owner's insurance, if applicable. Such losses may include settlements made with the approval of Owner. Do not include these losses, damages, and expenses in the Cost of the Work when determining Contractor's fee.
 - 7. Expenses incurred in preparing and advancing Claims.
 - 8. Any Indemnified Cost paid with regard to Contractor's indemnification of Owner's Indemnitees.
 - 9. Other overhead or general expense costs and the costs of items not described in Paragraph 13.01.C.
- E. Contractor's fee is determined in accordance with the Agreement when the Work is performed on a cost-plus basis.

- F. Contractor's Fee is determined as follows for Work included in a Change Proposal.
1. Contractor's fee is 15 percent of the costs included in the Cost of the Work per Paragraph 13.01.C.1 for payroll cost and per Paragraph 13.01.C.2 for cost of materials and equipment furnished and incorporated in the Work.
 2. Contractor's fee is 5 percent of costs included in the Cost of the Work paid by Contractor for Work performed by Subcontractors per Paragraph 13.01.C.3.
 3. No fee will be payable for costs included in the Cost of the Work for supplemental costs per Paragraph 13.01.C.4.
 4. Fees are to be determined as follows where one or more tiers of Subcontracts are used:
 - a. The Subcontractor's fee is 15 percent for costs incurred under Paragraphs 13.01.C (excluding Paragraph 13.01.C.3) for the Subcontractor that performs the Work;
 - b. The Contractor and Subcontractors of a tier higher than that of the Subcontractor that performs the Work are allowed a fee of 5 percent of the total costs incurred by the next lower tier Subcontractor; and
 - c. Regardless of the number of subcontractor tiers involved, the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that performs the Work.
- G. When a Change Proposal includes additions and credits, the Contractor's fee will be calculated on the sum of costs for each cost category in Paragraph 13.01.C. and applying the appropriate fee from Paragraph 13.01.E. The amount to be credited by Contractor to Owner for any Change Proposal which results in a net decrease in the Cost of Work will be the amount of the actual net decrease in the Cost of Work plus an additional amount equal to 5 percent of the actual net decrease in the Cost of Work.
- H. Establish and maintain records in accordance with generally accepted accounting practices and submit these records, including an itemized cost breakdown together with supporting data, in a form and at intervals acceptable to Construction Manager whenever the Cost of the Work is to be determined pursuant to this Paragraph 13.01.

13.02 Allowances

- A. Include allowances specified in the Contract Documents in the Contract Price and provide Work covered by the allowance as authorized by Owner through Construction Manager.
- B. Contractor agrees that:
1. The cash allowance is used to compensate Contractor for the cost of furnishing materials and equipment for the Work covered by the allowance item in the Contract Documents. Cost may include applicable taxes. Make provisions for trade discounts, rebates, and refunds and reduce the allowance costs by these amounts.
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances; and

3. Costs for cash allowances and installation costs as described in Paragraphs 13.02.B.1 and 13.02.B.2 above are included in the Contract Price.
- C. Construction Manager will issue a Change Order to adjust the Contract Price by the difference between the allowance amount and the actual amount paid by Contractor for Work covered by the allowance. The Change Order will be issued at the time costs are incurred by Contractor for Work covered by the allowance and this Work is included on the Application for Payment.

13.03 Unit Price Work

- A. The initial Contract Price for Unit Price Work is equal to the sum of the unit price line items in the Agreement. Each unit price line item amount is equal to the product of the unit price for each line item times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparing offers and determining an initial Contract Price. Payments to Contractor for Unit Price Work are to be based on actual quantities measured for Work in place.
- C. Each unit price is deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Construction Manager is to determine the actual quantities and classifications of Unit Price Work performed by Contractor to be incorporated into each Application for Payment. Construction Manager's decision on actual quantities is final and binding, subject to the provisions of Paragraph 13.03.E.
- E. Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price within 30 days of Construction Manager's decision under Paragraph 13.03.D, if:
 1. The total cost of a particular item of Unit Price Work amounts to 20 percent or more of the total Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 20 percent from the estimated quantity of an item indicated in the Agreement;
 2. There is no corresponding adjustment with respect to other items of Work; and
 3. Contractor believes it has incurred additional expense as a result of this condition or if Owner believes that the quantity variation entitles Owner to an adjustment in the Contract Price.
- F. Construction Manager will issue a Change Order adjusting estimated quantities to actual quantities to determine the final Contract Price.

13.04 Contingencies

- A. Contingency funds may be included in the Contract Price to pay for Work not defined specifically by the Contract Documents that is essential to the completion of the Project. Contingency funds will be as described in the Agreement.

- B. The contingency funds may be used for costs incurred by Contractor, provided these costs are approved by Owner. Costs are to be determined and documented in accordance with Paragraph 13.01. The contingency funds are not to be used for the following items:
 - 1. Cost overruns due to changes in material costs after the Contract Price is established, unless specific price escalation provisions are made in the Agreement;
 - 2. Rework required to correct Defective Work;
 - 3. Inefficiencies in completing the Work due to Contractor's selected means, methods, sequences, or procedures of construction;
 - 4. Work Contractor failed to include in the Contract Price;
 - 5. Changes required by changes in Laws and Regulations enacted after the Contract Price is established; or
 - 6. Any Work that does not constitute a change in Scope in the Work included in the Contract Price.
- C. Construction Manager is to issue a Change Order for approved expenditures from contingency funds. When the Change Order is issued, the costs are to be added to the Application for Payment. Contractor is to maintain a tabulation showing the contingency amount, adjustments to the contingency amount, and amounts remaining as the Project progresses.
- D. Any contingency amounts that are not included in a Change Order are retained by Owner. A Change Order will be issued to deduct unused contingency amounts from the Contract Price prior to Final Payment.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

- A. Provide safe access to the Site and the Work for the observation, inspection, and testing of the Work in progress. Contractor can require compliance with Contractor's safety procedures and programs as part of providing safe access.

14.02 Tests, Inspections, and Approvals

- A. OPT may retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform inspections. Cooperate with inspection and testing personnel and assist with providing access for required inspections, tests, and handling test specimens or Samples.
- B. Arrange for and facilitate inspections, tests, and approvals required by Laws or Regulations of governmental entities having jurisdiction that require Work to be inspected, tested, or approved by an employee or other representative of that entity. Pay associated costs and furnish Construction Manager with the required certificates of inspection or approval.
- C. Arrange, obtain, and pay for inspections and tests required:
 - 1. By the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to OPT;

2. To attain OPT's acceptance of materials or equipment to be incorporated in the Work;
 3. By manufacturers of equipment furnished under the Contract Documents;
 4. For testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work;
 5. For acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work;
 6. For re-inspecting or retesting Defective Work, including any associated costs incurred by the testing laboratory for cancelled tests or standby time; and
 7. For retesting due to failed tests.
- D. Provide independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to OPT to provide these inspections and tests.

14.03 Defective Work

- A. It is Contractor's obligation to ensure that the Work is not Defective.
- B. OPT has the authority to determine whether Work is Defective and to reject Defective Work.
- C. Construction Manager is to notify Contractor of Defective Work of which OPT has actual knowledge.
- D. Promptly correct Defective Work.
- E. Take no action that would void or otherwise impair Owner's special warranties or guarantees when correcting Defective Work.
- F. Pay claims, costs, losses, and damages arising out of or relating to Defective Work, including:
 1. Costs for correction, removal, and replacement of Defective Work;
 2. Cost of the inspection and testing related to correction of Defective Work;
 3. Costs for Design Professional's fees associated with review and approval of design modifications for correction, removal, and replacement of Defective Work.
 4. Fines levied against Owner by governmental authorities because of Defective Work; and
 5. Costs of repair or replacement of work of others resulting from Defective Work.

14.04 Acceptance of Defective Work

- A. Owner may elect to accept Defective Work instead of requiring correction or removal and replacement of Defective Work provided:
 1. This acceptance occurs prior to final payment;
 2. Design Professional confirms that the Defective Work is in general accordance with the design intent and applicable design principles; and

3. Design Professional confirms that acceptance of the Defective Work does not endanger public health or safety.
- B. Owner may impose a reasonable Set-off against payments due under Article 15 for costs associated with OPT's evaluation of Defective Work to determine if it can be accepted and to determine the diminished value of the Work. Owner may impose a reasonable Set-off against payments due under Article 15 if the parties are unable to agree as to the decrease in the Contract Price to compensate Owner for the diminished value of Defective Work accepted. Construction Manager is to issue a Change Order for acceptance of the Defective Work prior to final payment. Pay an appropriate amount to Owner if the acceptance of Defective Work occurs after final payment.

14.05 Uncovering Work

- A. OPT has the authority to require inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. Work that is covered prior to approval of Construction Manager must be uncovered for OPT's observation if requested by Construction Manager. Pay for uncovering Work and its subsequent restoration unless Contractor has given Construction Manager timely notice of Contractor's intention to cover the Work and Construction Manager fails to act with reasonable promptness in response to this notice.
- C. Provide necessary labor, material, and equipment and uncover, expose, or otherwise make available the portion of the Work suspected of being Defective for observation, inspection, or testing if OPT considers it necessary or advisable that covered Work be observed by Design Professional or inspected or tested by others as directed by Construction Manager.
 1. Pay for claims, costs, losses, and damages associated with uncovering, exposing, observing, inspecting, and testing if it is found that the uncovered Work is Defective. Pay costs for correction of Defective Work. Pay for reconstruction, repair, or replacement of work of others if it is found that the uncovered Work is Defective.
 2. Submit a Change Proposal for an increase in the Contract Price or an extension of the Contract Times directly attributable to this uncovering, exposure, observation, inspection, testing, and reconstruction if the uncovered Work is found to not be Defective.

14.06 Owner May Stop the Work

- A. Owner may order Contractor to stop the Work if:
 1. The Work is Defective;
 2. Contractor fails to supply sufficient skilled workers or suitable materials or equipment;
or
 3. Contractor performs Work that may fail to conform to the Contract Documents when completed.
- B. This stop work order is to remain in effect until the reason for the stop work order has been eliminated. Owner's right to stop the Work does not create a duty to exercise this right for the benefit of Contractor's Team or surety.

14.07 Owner May Correct Defective Work

- A. Owner may remedy Defective Work after 7 days' notice to Contractor if Contractor fails to correct Defective Work, or to remove and replace Defective Work as required by OPT;
- B. Owner may:
 - 1. Exclude Contractor from the Site;
 - 2. Take possession of the Work and suspend Contractor's services related to the Work; and
 - 3. Incorporate stored materials and equipment in the Work.
- C. Allow OPT access to the Site and off-site storage areas to enable Owner to exercise the rights and remedies under this paragraph.
- D. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 are to be charged against Contractor as a Set-off against payments due under Article 15. These claims, costs, losses, and damages include costs of repair and the cost of replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's Defective Work.
- E. Contractor is not allowed an extension of the Contract Times because of delays in the performance of the Work attributable to the exercise of the Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; FINAL COMPLETION

15.01 Progress Payments

- A. Progress payments are to be submitted to Construction Manager on the Application for Payment form provided by Construction Manager following procedures in the Contract Documents.
 - 1. Progress payments for lump sum Work are to be paid based on the earned value to date at the amounts shown in the Schedule of Values submitted as required by Paragraph 2.03. Final payment will be for the total lump sum amount.
 - 2. Progress payments for Unit Price Work are based on the number of units completed as determined under the provisions of Paragraph 13.03.
 - 3. Progress payments for Work to be paid based on the Cost of the Work per Article 13 are to be paid for Work completed by Contractor during the pay period.
- B. Reduction in Payment by Owner:
 - 1. Owner is entitled to impose a Set-off against payment based on the following:
 - a. Claims made against Owner or costs, losses, or damages incurred by Owner related to:
 - 1) Contractor's conduct in the performance of the Work, including workplace injuries, non-compliance with Laws and Regulations, or patent infringement; or

- 2) Contractor's failure to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site, including workplace injuries, property damage, and non-compliance with Laws and Regulations.
 - b. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - c. Work is Defective, or completed Work has been damaged by Contractor's Team, requiring correction or replacement;
 - d. Owner has been required to correct Defective Work or complete Work in accordance with Paragraph 14.07;
 - e. The Contract Price has been reduced by Change Orders;
 - f. Events have occurred that would constitute a default by Contractor justifying a termination for cause;
 - g. Liquidated or other damages have accrued because of Contractor's failure to achieve Milestones, Substantial Completion, or completion of the Work;
 - h. Liens have been filed regarding the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of these Liens;
 - i. Owner has been notified of failure to make payments to Subcontractors, Suppliers, or Employees;
 - j. Failure to submit up-to-date record documents as required by the Contract Documents;
 - k. Failure to submit monthly Progress Schedule updates or revised schedules as requested by Construction Manager;
 - l. Failure to provide Project photographs required by the Contract Documents;
 - m. Failure to provide Certified Payroll required by the Contract Documents;
 - n. Compensation for OPT for overtime charges of Construction Manager, third review of Shop Drawings, review of substitutions, re-inspection fees, inspections or designs related to correction of Defective Work, or other services identified as requiring payment by Contractor;
 - o. Costs for tests performed by Owner to verify that Work previously tested and found to be Defective has been corrected;
 - p. OPT has actual knowledge of the occurrence of events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents with associated cost impacts;
 - q. Payment would result in an over-payment of the Contract Price; or
 - r. Other items entitling Owner to a Set-off against the amount recommended.
2. Compensation for services of OPT staff is to be at the rates established in the Supplementary Conditions.

3. Construction Manager is to notify Contractor stating the amount and the reasons for an imposed Set-off. Owner is to pay Contractor amounts remaining after deduction of the Set-off. Owner is to pay the Set-off amount agreed to by Owner and Contractor if Contractor remedies the reasons for the Set-off. Contractor may submit a Change Proposal contesting the Set-off.
- C. No payment will be made for Work authorized by a Work Change Directive until the Work Change Directive is incorporated into a Change Order, unless arrangements or interim payments have been included in the Work Change Directive. Payment can be included in an Application for Payment when the Change Order is approved.
- D. Owner is to pay the amount of payment recommended by Construction Manager within 30 days after receipt of the Application for Payment and accompanying documentation from Construction Manager.
- E. Contractor certifies that all Work, including materials, covered by each Application for Payment have been completed or delivered and stored in accordance with the Contract Documents, that all amounts have been paid for Work, materials, and equipment for which previous payment has been made by Owner, and that the current payment amount shown in this Application for Payment is due.

15.02 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to the Work, materials, and equipment furnished under the Contract is to pass to Owner free and clear of Liens, title defects, and patent, licensing, copyright, or royalty obligations no later than 7 days after the time of payment by Owner of the Application for Payment which includes these items.

15.03 Substantial Completion

- A. Notify Construction Manager when the Work or portion of the Work to be accepted under Paragraph 15.04 is substantially complete and request a Certificate of Substantial Completion.
- B. OPT is to inspect the Work after Contractor's notification to determine if the Work is substantially complete. Construction Manager is to either issue the Certificate of Substantial Completion which sets the date of Substantial Completion or notify Contractor of the reasons the Project is not considered to be substantially complete.
- C. The OPT and Contractor are to meet to discuss Owner's use or occupancy of the Work following Substantial Completion. Items to be discussed at this meeting include:
 1. Review of insurance policies with respect to the end of the Contractor's coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner;
 2. Owner's assumption of responsibility for security, operation, protection of the Work, maintenance, and utilities upon Owner's use or occupancy of the Work;
 3. Contractor's obligations for operations and maintenance during performance and acceptance testing;
 4. Contractor's access to the Site to complete punch list items; and

5. Procedures for correction of Defective Work during the one-year correction period.

15.04 Partial Utilization

- A. Owner may use or occupy substantially completed parts of the Work which are specifically identified in the Contract Documents, or which OPT and Contractor agree constitutes a separately functioning and usable part of the Work prior to Substantial Completion of the Work. Owner must be able to use that part of the Work for its intended purpose without significant interference with Contractor's performance of the remainder of the Work. Contractor and OPT are to follow the procedures of Paragraph 15.03 for this part of the Work.
- B. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Article 6.

15.05 Final Inspection

- A. OPT is to make a final inspection upon notice from Contractor that the entire Work or portion to be accepted under Paragraph 15.04 is complete. Construction Manager is to notify Contractor of Work determined to be incomplete or Defective. Immediately take corrective measures to complete the Work and correct Defective Work.
- B. Notify Construction Manager when the entire Project and ready for Final Payment under Paragraph 15.06 and request a Certificate of Final Completion.
- C. OPT is to inspect the Work after Contractor's notification to determine if the Project is complete. Construction Manager is to either issue the Certificate of Final Completion which sets the date of Final Completion or notify Contractor of the reasons the Project is not considered to be complete.

15.06 Final Payment

- A. Make application for final payment after completing required corrections identified during the final inspection and delivering items and documents required by the Contract Documents. Provide the following with the final Application for Payment:
 - 1. Consent of Surety to Final Payment acknowledging unsettled disputes; or
 - 2. Affidavit of Payment of Debts and Claims or Affidavit of Release of Liens or furnish receipts or releases from Subcontractors and Suppliers when a payment bond is not required.
- B. Construction Manager is to either recommend payment of the final Application for Payment to Owner if OPT is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled or notify Contractor of OPT's reasons for not recommending final payment.
- C. The Work is complete, subject to surviving obligations, when it is ready for final payment as established by the Construction Manager's recommendation of payment of the final Application for Payment to Owner and the issuance of a Certificate of Final Completion.
- D. Owner is to pay the amount of final payment recommended by Construction Manager within 30 days after receipt of the final Application for Payment and accompanying

documentation from Construction Manager; unless additional time is required for approval of a governing board or entity. Payment will be within 30 days of approval by the governing board or entity.

15.07 Waiver of Claims

- A. The making of final payment does not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from:
 - 1. Unsettled Liens or claims for non-payment;
 - 2. Defective Work appearing after final inspection pursuant to Paragraph 15.05;
 - 3. Contractor's failure to comply with the terms of special guarantees specified in the Contract Documents;
 - 4. Outstanding Claims or express reservation of rights by Owner; or
 - 5. Contractor's continuing obligations under the Contract Documents.
- B. Contractor waives claims and rights against Owner by accepting final payment except for those Claims made in accordance with the provisions of Article 17 and specifically noted in the Certificate of Final Completion.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

- A. Owner may suspend the Work or a portion of the Work for a period of not more than 90 consecutive days, at any time and without cause, by notice to Contractor. This notice fixes the date on which Contractor is to resume Work. Contractor is entitled to adjustments in the Contract Price and Contract Times directly attributable to this suspension. Submit a Change Proposal seeking an adjustment no later than 30 days after the date fixed for resumption of Work.

16.02 Owner May Terminate for Cause

- A. The occurrence of one or more of the following events constitutes a default by Contractor and justifies termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents, including failure to supply sufficient skilled workers or suitable materials or equipment;
 - 2. Failure to adhere to the Progress Schedule;
 - 3. Failure of Contractor to provide a satisfactory replacement bond or insurance in the event either is lost or canceled;
 - 4. Failure of Contractor to maintain financial solvency to adequately complete the Project as indicated by one or more of the following:
 - a. A petition of bankruptcy is filed by or against Contractor;
 - b. Contractor is adjudged as bankrupt or insolvent;

- c. Contractor or surety makes a general assignment for the benefit of creditors;
 - d. A receiver is appointed for the benefit of Contractor's creditors; or
 - e. A receiver is appointed because Contractor's insolvency;
- 5. Contractor's disregard of Laws or Regulations of public bodies having jurisdiction; or
- 6. Contractor's repeated disregard of the authority of OPT.
- B. Contractor and surety must provide adequate assurance of future performance in accordance with the Contract Documents that is satisfactory to Owner if Contractor is believed to be in financial distress due to the existence of one or more of the indicators listed in Paragraph 16.02.A.4. Owner may terminate this Contract if Contractor and surety fail to provide adequate documentation satisfactory to Owner within 10 days of Construction Manager's request for this information.
- C. Owner may declare Contractor to be in default, give notice to Contractor and surety that the Contract is terminated, and enforce the rights available to Owner under the performance bond after giving Contractor and surety 10 days' notice that one or more of the events identified in Paragraph 16.02.A has occurred.
- D. Owner may exclude Contractor from the Site, take possession of the Work, incorporate the materials and equipment stored and complete the Work as Owner may deem expedient if Owner has terminated the Contract for cause.
- E. Owner may elect not to proceed with termination of the Contract under this Paragraph 16.02 if Contractor begins to cure the cause for termination within 7 days of receipt of notice of intent to terminate.
- F. Contractor is not entitled to receive further payments until the Work is completed if Owner proceeds as provided in this Paragraph 16.02. The amount of the Contract Price remaining is to be paid to Contractor if the unpaid balance exceeds the cost to complete the Work. This cost to complete the Work may include related claims, costs, losses, damages, and the fees and charges of engineers, architects, attorneys, and other professionals retained by Owner. Pay the difference to Owner if the cost to complete the Work including related claims, costs, losses, and damages exceeds the unpaid balance of the Contract Price. Claims, costs, losses, and damages incurred by Owner are to be reviewed as to their reasonableness and incorporated in a Change Order by Construction Manager. Owner is not required to obtain the lowest price for the Work performed when exercising its rights or remedies under this paragraph.
- G. Termination does not affect the rights or remedies of Owner against Contractor or against surety under the payment bond or performance bond. Owner does not release Contractor from liability by paying or retaining money due Contractor.

16.03 Owner May Terminate for Convenience

- A. Owner may terminate the Contract without cause after giving 7 days' notice to Contractor of the effective date of termination. Contractor is to be paid for the following if Owner terminates for convenience:
 - 1. Work completed in accordance with the Contract Documents prior to the effective date of termination;

2. Actual costs sustained prior to the effective date of termination for Work in progress, plus a fair and reasonable amount for overhead and profit; fee calculated in accordance with Paragraph 13.01; and
 3. Reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor will not be paid for loss of anticipated profits or revenue, post termination overhead costs, or other economic loss arising out of or resulting from this termination.

16.04 Contractor May Stop Work or Terminate

- A. Contractor may terminate the Contract and issue a Change Proposal requesting payment from Owner on the same terms as provided in Paragraph 16.03 after 10 days' notice to Construction Manager provided that, through no act or fault of Contractor:
1. The Work is suspended for more than 90 consecutive days by Owner;
 2. Construction Manager fails to act on an Application for Payment within 30 days after it is submitted; or
 3. Owner fails to pay Contractor sums determined to be due, other than the final payment, within 30 days after payment is recommended by Construction Manager; and
 4. OPT does not remedy this suspension or failure within 10 days after receipt of the notice.
- B. Contractor may stop Work, without prejudice to other rights or remedies in lieu of terminating the Contract if Construction Manager has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed to pay Contractor within 30 days after payment is recommended by Construction Manager. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times for damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

- A. The Owner or Contractor may appeal a Claim, approved or denied in part or in full, by:
1. Electing to invoke the dispute resolution process if one is provided for in the Supplementary Conditions;
 2. Agreeing with the other party to submit the dispute to a dispute resolution process; or
 3. Notifying the other party of the intent to submit the dispute to a court of competent jurisdiction if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to.

ARTICLE 18 – MISCELLANEOUS

18.01 Computation of Times

- A. Exclude the first day and include the last day when determining dates for a period referred to in the Contract Documents by days. The last day of this period is to be omitted from the determination if it falls on a Saturday, Sunday, or a legal holiday.
- B. All references and conditions for a calendar day contract in the Contract Documents apply for a Fixed Date Contract. A fixed date contract is one in which the calendar dates for reaching Substantial Completion and/or Final Completion are specified in lieu of identifying the number of calendar days involved.

18.02 Independent Contractor

- A. Contractor is to perform its duties under this Contract as an independent contractor. Contractor's Team and their personnel are not considered to be employees or agents of Owner. Nothing in this Agreement is to be interpreted as granting Contractor's Team the right or authority to make commitments for Owner. This Agreement does not constitute or create a joint venture, partnership, or formal business organization of any kind.

18.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available to the Owner or Contractor by these General Conditions are in addition to, and are not a limitation of, the rights and remedies which are otherwise imposed or available by:
 - 1. Laws or Regulations,
 - 2. Special warranties or guarantees, or
 - 3. Other provisions of the Contract Documents.
- B. The provisions of this Paragraph 18.03 are as effective as if repeated specifically in the Contract Documents regarding each duty, obligation, right, and remedy to which they apply.

18.04 Limitation of Damages

- A. Owner's Indemnitees are not liable to Contractor for claims, costs, losses, or damages sustained by Contractor's Team associated with other projects or anticipated projects.

18.05 No Waiver

- A. The failure of Owner or Contractor to enforce any provision of this Contract does not constitute a waiver of that provision, affect the enforceability of that provision, or the enforceability of the remainder of this Contract.

18.06 Severability

- A. If a court of competent jurisdiction renders a part of this Contract invalid or unenforceable, that part is to be severed and the remainder of this Contract continues in full force.

18.07 Survival of Obligations

- A. Representations, indemnifications, warranties, guarantees, and continuing obligations required by the Contract Documents survive completion and acceptance of the Work or termination of the Contract.

18.08 No Third-Party Beneficiaries

- A. Nothing in this Contract can be construed to create rights in any entity other than the Owner and Contractor. Neither the Owner nor Contractor intends to create third party beneficiaries by entering into this Contract.

18.09 Successors and Assigns

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents

18.10 Assignment of Contract

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights or interests in the Contract will be binding on the other party without the written consent of the other party. Money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.11 No Waiver of Sovereign Immunity

- A. Owner has not waived its sovereign immunity by entering into and performing its obligations under this Contract.

18.12 Controlling Law

- A. This Contract is to be governed by the law of the state in which the Project is located.
- B. Venue for legal proceedings lies exclusively in the county in which the Owner's home office is located unless specified elsewhere in the Contract Documents.

END OF SECTION

00 73 00 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement Section 00 72 00 "General Conditions." The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below.

The paragraph numbers used in the Supplementary Conditions correspond to the General Condition paragraphs they modify with the prefix "SC" added—for example, "Paragraph SC-4.05." modifies General Conditions Paragraph 4.05.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

- A. The Owner's Project Team as defined in the Paragraph 1.01.A.45 of the General Conditions consists of the following organizations:
 - 1. City of Beaumont
801 Main Street
Beaumont, Texas 77701
 - 2. Freese and Nichols, Inc. (FNI)
Attn: Somnath Chilukuri, P.E.
11200 Broadway St., Suite 2320
Pearland, Texas 77584

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.03 Before Starting Construction

- A. Add the following sentence to Paragraph 2.03.A.4:
"No construction shall begin until after Schedule of Anticipated Payments has been approved."

ARTICLE 5 – SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

- A. This Supplementary Condition identifies the reports and drawings referenced in Paragraph 5.03 of the General Conditions related to subsurface and physical conditions.

1. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Report Date	Technical Data
None		

2. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawing Title	Drawing Date	Technical Data
None		

3. Copies of reports and drawings may be downloaded from the procurement website.

SC-5.06 Hazardous Environmental Conditions at Site

- A. This Supplementary Condition identifies the reports and drawings referenced in Paragraph 5.06 of the General Conditions related to Hazardous Environmental Conditions at the Site.

1. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Report Date	Technical Data
None		

2. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawing Title	Drawing Date	Technical Data
None		

Drawing Title	Drawing Date	Technical Data

3. Copies of reports and drawings may be downloaded from the procurement website.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.01 Performance, Payment, and Other Bonds

- A. Supplement Paragraph 6.01.D of the General Conditions by adding the following subparagraph(s):
- “1. Contractor must provide a warranty bond for equipment as specified. Surety company providing the warranty bond may be the same surety company that provides the performance bond for the Project. The term and amount of the bond will be as specified in the bond form. Bond must be written to cover the interest of the Contractor and Owner and be transferable to Owner at Final Completion.”
- “2. Contractor must provide a process performance bond in the full amount of the equipment cost as indicated in the amount shown for the equipment listed below and as described in the noted Specification Sections. This bond is to become effective the date of Substantial Completion for the equipment so designated in accordance with Paragraph 15.03, and will remain in effect for a period of 2 years after the date of Substantial Completion, except as provided otherwise by Laws or Regulations. Surety for the process performance bond must meet the same requirements as for performance and payment bonds set forth in Article 6. Specific requirements for these process performance bonds must be as established in the noted Specification Sections.”

Specification Section	Description of Equipment	Bond Amount	Bond Duration

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

SC-7.15 Indemnification

- A. Supplement Paragraph 7.15 by adding the following paragraph:
- “C. Contractor’s obligations to indemnify or hold Owner’s Indemnitees harmless against losses, damages, or expenses specified in these General Conditions shall be subject to the applicable limitations of Chapter 130 of the Texas Civil Practice and Remedies Code.”

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01 Cost of the Work

- A. Supplement Paragraph 13.01.C.4.d.1) by adding the following sentence:
“The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of the United Rentals rate book.”

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; FINAL COMPLETION

SC-15.03 Substantial Completion

- A. The following work must be complete before the Project may be considered Substantially Complete:
 - 1. The polymer system modifications are installed and completely operable.
 - 2. The chemical storage system modifications are installed and completely operable.

END OF SECTION

00 73 16 INSURANCE REQUIREMENTS

ARTICLE 1 – GENERAL PROVISIONS

1.01 CONTRACTOR’S INSURANCE

- A. Obtain and maintain insurance that complies with this Section with coverage amounts equal to or greater than the amounts specified in Article 2 or greater where required by Laws and Regulations.
- B. Coverage is to remain in effect at least until the Work is complete and longer if expressly required elsewhere in this Contract, and when Contractor may be correcting, removing, or replacing Defective Work as a warranty or correction obligation, or returning to the Site to conduct other tasks arising from the Contract.
- C. Coverage is to apply with respect to the performance of the Work, whether performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- D. Obtain insurance from companies that are duly licensed or authorized in the state in which the Project is constructed to issue insurance policies for the required limits and coverages and that have an A.M. Best rating of A-VIII or better.
- E. Alternative forms of insurance coverage, including self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not acceptable to meet the insurance requirements of this Contract.
- F. Owner will not purchase or maintain insurance to protect the interest of the Contractor, Subcontractors, or others in the Work. Owner does not represent that the insurance coverage and limits established in this Contract are adequate to protect Contractor or Contractor’s interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary and including the cost of this insurance in the offered Contract Price.
- G. Contractor is fully responsible for all losses arising out of, resulting from or connected with operations under this Contract whether or not these losses are covered by insurance. The acceptance of evidence of insurance by the OPT, or others listed as an additional insured, that does not comply with the Contract requirements does not release the Contractor from the requirement to comply with Contract requirements.
- H. The required insurance and insurance limits do not limit the Contractor’s liability under the indemnities granted to Owner’s Indemnitees in the Contract Documents.
- I. Do not perform any Work on the Project unless the required insurance policies are in effect. Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under the General Conditions if Contractor fails to obtain or maintain the required insurance.
- J. Policies must provide notice before cancellation, non-renewal or any material change in the policy’s terms and conditions as described in Paragraph 1.04.D. Contractor is to notify Owner and the additional insured of any notice received within 3 days of receipt of a notice

by Contractor. Contractor is to cease all Work covered by cancelled or non-renewed insurance if suitable coverage is not in place in time to prevent a lapse in coverage. Contractor is solely responsible for any delays associated with lapsed coverage.

- K. Owner may elect, but is in no way obligated, to obtain equivalent insurance to protect Owner's interests without prejudice to any other right or remedy if the Contractor fails to obtain or maintain the required insurance. Owner may impose a reasonable set-off against payments to recover the cost of the insurance.
- L. Owner's policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's policies to meet any of Contractor's obligations to the Owner, Design Professional, or third parties.

1.02 SUBCONTRACTOR OR SUPPLIER INSURANCE

- A. Require Subcontractors to purchase and maintain workers' compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project. Include OPT as additional insureds on Subcontractor's policies in accordance with Paragraph 1.03.
- B. Require Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- C. Contractor is liable for all losses that would have been covered by Subcontractor or Supplier insurance if Subcontractor or Supplier fails to provide coverage.

1.03 ADDITIONAL INSURED

- A. The following are to be named as an additional insured on all insurance policies, except workers' compensation insurance, builder's risk insurance, and the Contractor's professional liability insurance:
 - 1. City of Beaumont
Attn: Water Utilities Department
801 Main Street
Beaumont, TX 77701
 - 2. Freese and Nichols, Inc.
Attn: Will Allanach, Risk Management
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
- B. All insurance related notices are to be sent to the addresses listed above.
- C. Notify the Owner and additional insured if the Contractor fails to purchase or maintain the insurance required by the Contract Documents.
- D. All insurance policies must include a waiver of subrogation in favor of each additional insured.
- E. Provide for an endorsement that the "other insurance" clause will not apply to the OPT where the OPT is an additional insured. Contractor's insurance is primary and non-contributory with respect to any insurance or self-insurance carried by the OPT for liability arising out of operations under this Contract.

1.04 EVIDENCE OF INSURANCE

- A. Deliver evidence of insurance, in accordance with this Section, to the Owner with the signed Contract Documents to demonstrate that Contractor has obtained the policies, coverages, and endorsements required by the Contract.
 - 1. Continue to provide evidence Contractor is maintaining the required insurance for the duration of the Contract Times and such extended periods as required by the Contract Documents.
 - 2. Provide this evidence of insurance to Owner and each additional insured.
 - 3. Contractor may block out (redact) any confidential premium or pricing information and wording specific to a project or jurisdiction in any policy or endorsement furnished under this paragraph not applicable to this Contract.
- B. OPT's failure to demand evidence of insurance or verify the Contractor's full compliance with insurance requirements or failure to identify a deficiency in compliance from the evidence provided is not a waiver of the Contractor's obligation to obtain and maintain the insurance required by the Contract Documents
- C. Provide evidence of insurance acceptable to the Owner with the executed Contract Documents. Provide the following as evidence of insurance:
 - 1. Copy of insurance policies;
 - 2. Certificates of insurance on an acceptable form;
 - 3. Full disclosure of exclusions;
 - 4. Declaration pages, riders, or endorsements to policies;
 - 5. Documentation of deductibles;
 - 6. List of named and additional insureds for each policy; and
 - 7. Evidence that waivers of subrogation are provided on applicable policies.
- D. Provide evidence of a requirement in the policy that at least 10 days' notice will be given before cancellation, non-renewal or any material change in the policy's terms and conditions including:
 - 1. Type of coverage provided;
 - 2. Riders or endorsements to policies;
 - 3. Policy limits of coverage;
 - 4. Change in deductible amount;
 - 5. Status of named or additional insured; or
 - 6. Waivers of subrogation.
- E. Certificates of Insurance:
 - 1. Submit certificates of insurance meeting the applicable requirements of the applicable state department of insurance. No requirement of this Contract may be interpreted as requiring the issuance of a certificate of insurance on a form that has not first been filed with and/or approved by the applicable state department of insurance.

2. Include the name of the Project in the description of operations box on the certificate of insurance, and the name of each additional insured.
- F. Continuing Evidence of Coverage:
1. Provide updated, revised, or new evidence of insurance prior to the expiration of existing policies. A certificate of insurance is acceptable as evidence of renewal of insurance policies, provided no changes are made in the policy originally provided with signed Contract Documents.
 2. Provide evidence of continuation of insurance coverage at final payment and for the following 3 years.

ARTICLE 2 – INSURANCE COVERAGE AMOUNTS AND POLICY REQUIREMENTS

2.01 CONTRACTOR’S INSURANCE

A. Workers’ Compensation and Employer’s Liability Insurance:

1. Purchase and maintain workers’ compensation and employer’s liability insurance, including, as applicable, United States Longshoreman and Harbor Workers’ Compensation Act, Jones Act, stop-gap employer’s liability coverage for monopolistic states, and foreign voluntary workers’ compensation, including off-site operations.
2. Provide the following coverage with not less than the minimum limits indicated:

Workers’ Compensation and Related Insurance	Policy Limits
Workers’ Compensation	
State	Statutory
Applicable Federal (e.g., Longshore)	Statutory
Foreign Voluntary Workers’ Compensation (Employer’s Responsibility Coverage), if Applicable	Statutory
Jones Act (if applicable)	
Bodily Injury by Accident – Each Accident	\$1,000,000
Bodily Injury by Accident – Aggregate	\$1,000,000
Bodily Injury by Disease – Each Occurrence	\$1,000,000
Bodily Injury by Disease – Aggregate	\$1,000,000
Employers’ Liability	
Each Accident	\$1,000,000
Each Employee	\$1,000,000
Policy Limit	\$1,000,000

B. Commercial General Liability

1. Purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
 - a. Damages because of bodily injury, sickness or disease, or death of any person other than Contractor’s employees;
 - b. Damages insured by reasonably available personal injury liability coverage; and

- c. Damages because of injury to or destruction of tangible property wherever located, including loss of use resulting from the damage.
- 2. Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form).
 - a. Provide additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). Equivalent endorsements may be used if Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available.
 - b. Provide ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent for Design Professional additional insured.
- 3. Provide the following coverages and endorsements:
 - a. Products and completed operations coverage.
 - 1) Maintain coverage for 3 years after final payment.
 - 2) Provide Owner and each other additional insured evidence of continuation of such insurance at final payment and for 3 years thereafter.
 - b. Blanket contractual liability coverage, including coverage of Contractor's contractual indemnity obligations in the General Conditions.
 - c. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 - d. Underground, explosion, and collapse coverage.
 - e. Personal injury coverage.
- 4. The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
 - a. Modifications of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 - b. Exclusion for water intrusion or water damage.
 - c. Provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 - d. Exclusion of coverage relating to earth subsidence or movement.
 - e. Exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than workers' compensation).
 - f. Limitations or exclusions based on the nature of Contractor's work.
 - g. Professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

5. Provide the following coverage with not less than the minimum limits indicated:

Commercial General Liability Insurance	Policy Limits
General Aggregate	\$1,000,000 / Occurrence \$5,000,000 / Aggregate
Products - Completed Operations	\$1,000,000 / Occurrence \$5,000,000 / Aggregate
Personal and Advertising Injury (Limit Per Person)	\$1,000,000
Bodily Injury and Property Damage – Each Occurrence	\$1,000,000
Limit Per Person – Medical Expense	\$5,000
Personal Injury Liability coverage will include claims arising out of Employment Practices Liability, limited to coverage provided under standard contract.	\$1,000,000
Property Damage Liability insurance will provide explosion, collapse, and underground coverage where applicable	\$1,000,000
Watercraft Liability Policy. Coverage shall apply to all vessels	\$1,000,000
Excess Liability, Umbrella Form to include coverage of Watercraft Liability. General Aggregate – Each Occurrence	\$1,000,000

C. Automobile Liability:

- Purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis. Coverage can be provided through individual limits for bodily injury and for property damage or a combined single limit covering both bodily injury and property damage.
- Provide the following coverage with not less than the minimum limits indicated:

Automobile Liability Insurance	Policy Limits
Bodily Injury	
Each Person	\$1,000,000
Each Accident	\$1,000,000
Property Damage	
Each Accident	\$1,000,000
Combined Single Limit	
Combined Single Limit for Bodily Injury and Property Damage	\$1,000,000

2.02 INSTALLATION FLOATER

- A. Provide and maintain installation floater insurance on a broad form or “all risk” policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work (“Covered Property”). Coverage under the Contractor’s

installation floater will include loss from covered “all risk” causes (perils) to Covered Property:

1. of the Contractor, and Covered Property of others that is in Contractor’s care, custody, and control;
 2. while in transit to the Site, including while at temporary storage sites;
 3. while at the Site awaiting and during installation, erection, and testing;
 4. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.
- B. The installation floater coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable.
- C. The installation floater coverage will be in an amount sufficient to protect Contractor’s interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.
- D. This policy will include a waiver of subrogation applicable to Owner, Contractor, Design Professional, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

2.03 OWNER’S LIABILITY INSURANCE

- A. Contractor is required to provide Owner’s Protective Liability Insurance coverage for the same minimum amounts as the Contractor’s liability insurance coverage, unless greater amounts are required by Laws and Regulations.

END OF SECTION

00 73 16.1 INSURANCE REQUIREMENT AFFIDAVIT

**CITY OF BEAUMONT
INSURANCE REQUIREMENT AFFIDAVIT**

**To be Completed by Appropriate Insurance Agent
and submitted with bid proposal.**

I, the undersigned Agent/Broker, certify that the insurance requirements contained in this bid document have been reviewed by me with the below identified Contractor. If the below identified Contractor is awarded this contract by the City of Beaumont, I will be able to, within ten (10) days after being notified of such award, furnish a valid insurance certificate to the City meeting all of the requirements defined in this bid.

Agent (Signature)

Agent (Print)

Name of Agency/Broker: _____

Address of Agent/Broker: _____

City/State/Zip: _____

Agent/Broker Telephone #: _____ ()

CONTRACTOR'S NAME: _____

(Print or Type)

NOTE TO AGENT/BROKER

If this time requirement is not met, the City has the right to invalidate the bid award and award the contract to the next lowest bidder meeting specifications. Should an awarded bid be invalidated the Contractor may be liable for breach of contract. If you have any questions concerning these requirements, please contact the Purchasing Manager for the City of Beaumont at (409) 880-3720.

END OF SECTION



CERTIFICATE OF INSURANCE

Form No. COB1
Edition Date: 12/12/2018
Page 1 of 4

This form is for informational purposes only and certifies that policies of insurance listed below have been issued to insured named below and are in force at this time. Notwithstanding any requirements, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, insurance afforded by policies described herein is subject to all terms, exclusions and conditions of such policies.

Prior to the beginning of work, the vendor shall obtain the minimum insurance and endorsements specified. Agents must complete the form providing all requested information and submit by fax, U.S. mail or e-mail as requested by the City of Beaumont ("COB"). The endorsements listed below are required as attachments to this certificate; copies of the endorsements are also acceptable. PLEASE ATTACH ALL ENDORSEMENTS TO THIS FORM AND INCLUDE THE MATCHING POLICY NUMBER ON THE ENDORSEMENT. Only City of Beaumont certificates of insurance are acceptable; commercial carriers' certificates are not.

This certificate shall be completed by a licensed insurance agent:

Name and Address of Agency:

Phone: _____ / _____

Name and Address of Insured:

Phone: _____ / _____

Prime or Sub-Contractor?: _____

Name of Prime Contractor, if different from Insured:

City of Beaumont Reference:

Project Name: _____

Project Location: _____

Managing Dept.: _____

Project Mgr.: _____

Insurers Affording Coverages:

Insurer A

Insurer B

Insurer C

Insurer D



CERTIFICATE OF INSURANCE

Form No. COB1
Edition Date: 12/12/2018
Page 2 of 4

INSR LTR	TYPE OF INSURANCE	POLICY NO.	POLICY EFF. DATE (MM/DD/YYYY)	POLICY EXP. DATE (MM/DD/YYYY)	LIMITS OF LIABILITY	
	Commercial General Liability Policy As defined in the Policy, does the Policy provide:				Each Occurrence	\$
					General Aggregate	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Completed Operations/Products				Completed Operations/ Products Aggregate	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Contractual Liability				Personal & Advertising Injury	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Explosion				Deductible or Self Insured Retention	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Collapse					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Underground					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Contractors / Subcontractors Work					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Aggregate Limits per Project Form - CG 2503 0509 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Additional Insured Form (not construction) - CG 2010 1001 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Completed Operations Additional Insured Form (construction only) - CG2037 1001 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – 30 Day Notice of Cancellation Form - CG 2804 1093 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Waiver of Subrogation Form - CG 2404 0509 or Equivalent <input type="checkbox"/> Yes					
	INSR LTR	TYPE OF INSURANCE	POLICY NO.	POLICY EFF. DATE (MM/DD/YYYY)	POLICY EXP. DATE (MM/DD/YYYY)	LIMITS OF LIABILITY
	Pollution / Environmental Impairment Policy				Occurrence	\$
					Aggregate	\$
INSR LTR	TYPE OF INSURANCE	POLICY NO.	POLICY EFF. DATE (MM/DD/YYYY)	POLICY EXP. DATE (MM/DD/YYYY)	LIMITS OF LIABILITY	
	Commercial Auto Liability Policy As defined in the Policy, does the Policy provide:				CSL	\$
					Bodily Injury (Per Incident)	\$
					<input type="checkbox"/> Yes <input type="checkbox"/> No – Any Auto	Bodily Injury (Per Person)



CERTIFICATE OF INSURANCE

Form No. COB1
Edition Date: 12/12/2018
Page 3 of 4

	<input type="checkbox"/> Yes <input type="checkbox"/> No – All Owned Autos				Property Damage (Per Accident)	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Non-Owned Autos					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Hired Autos					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Waiver of Subrogation - CA0444 0410 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – 30 Day Notice of Cancellation - CA0244 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Additional Insured - CA2048 or Equivalent <input type="checkbox"/> Yes					
	<input type="checkbox"/> Yes <input type="checkbox"/> No – MCS 90					
INSR LTR	TYPE OF INSURANCE	POLICY NO.	POLICY EFF. DATE (MM/DD/YYYY)	POLICY EXP. DATE (MM/DD/YYYY)	LIMITS OF LIABILITY	
	Excess Liability <input type="checkbox"/> Umbrella Form <input type="checkbox"/> Excess Liability Follow Form				Occurrence	\$
					Aggregate	\$
	Workers Compensation & Employers Liability As defined in the Policy, does the Policy provide				<input type="checkbox"/> Statutory	
					Each Accident	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Waiver of Subrogation - WC420304				Disease - Policy Limit	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – 30 Day Notice of Cancellation - WC420601				Disease - Each Employee	\$
	Is a Builders Risk or Installation Insurance Policy provided? <input type="checkbox"/> Yes <input type="checkbox"/> No					\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – Is the City shown as loss payee/mortgagee?					
	Professional Liability As defined in the Policy, does the Policy provide:				Each Claim	\$
	<input type="checkbox"/> Yes <input type="checkbox"/> No – 30 Day Notice of Cancellation Retroactive Date:				Deductible or Self Insured Retention	\$



CERTIFICATE OF INSURANCE

Form No. COB1
Edition Date: 12/12/2018
Page 4 of 4

AGENT CERTIFICATION:

THIS IS TO CERTIFY TO THE CITY OF BEAUMONT
that the insurance policies above are in full force and effect.

Name of Insurance Company:	Name of Authorized Agent:
Company Address:	Agent's Address:
City: State: Zip:	City: State: Zip:
Authorized Agent's Phone Number (including Area Code):	Original signature of Authorized Agent: X _____
	Date:

CERTIFICATE HOLDER:

DATE ISSUED: _____

City of Beaumont

P. O. Box 3827
Beaumont, Texas 77704-3827

AUTHORIZED REPRESENTATIVE SIGNATURE
Licensed Insurance Agent

Printed Name: _____

END OF SECTION

00 73 17 TEXAS WORKERS' COMPENSATION INSURANCE

ARTICLE 1 – REQUIRED NOTICE

1.01 Workers' Compensation Insurance Coverage

A. Definitions:

1. Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the division, or a coverage agreement (DWC Form 81, DWC Form 82, DWC Form 83, or DWC Form 84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.
 2. Duration of the project - includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.
 3. Persons providing services on the project ("subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.
- B. The contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.
- C. The contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.
- D. If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.
- E. The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:
1. a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
 2. no later than 7 days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

- F. The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.
- G. The contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.
- H. The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.
- I. The contractor shall contractually require each person with whom it contracts to provide services on a project, to:
 - 1. provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;
 - 2. provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;
 - 3. provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
 - 4. obtain from each other person with whom it contracts, and provide to the contractor:
 - a. a certificate of coverage, prior to the other person beginning work on the project; and
 - b. a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
 - 5. retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
 - 6. notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
 - 7. contractually require each person with whom it contracts, to perform as required by paragraphs 1-7, with the certificates of coverage to be provided to the person for whom they are providing services.
- J. By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the

division. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

- K. The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

As defined by the Texas Labor Code, Chapter 269, Section 406.096(e), building or construction is defined as:

1. Erecting or preparing to erect a structure, including a building, bridge, roadway, public utility facility, or related appurtenance;
2. Remodeling, extending, repairing, or demolishing a structure; or
3. Otherwise improving real property or an appurtenance to real property through similar activities.

The employment of a maintenance employee who is not engaging in building or construction as the employer's primary business does not constitute engaging in building or construction.

END OF SECTION

00 73 43 WAGE RATE REQUIREMENTS

ARTICLE 1 – PAYMENT OF PREVAILING WAGE RATES

- 1.01 Contractor and Subcontractors employed on this Project must pay not less than the rates established by the Owner as required by Tex. Gov't Code Chapter 2258.
- 1.02 The minimum wage rates for various labor classifications as established by the Owner are included in Section 00 73 46 "Wage Determination Schedule."

ARTICLE 2 – PENALTY

- 2.01 In accordance with Section 2258.023(b), any Contractor or Subcontractor who violates the requirements of Chapter 2258 shall pay the Owner \$60 for each worker employed or each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the Contract.
- 2.02 Failure to comply with the requirements of Chapter 2258 may subject the Owner, Contractor, or Subcontractor(s) to additional civil and criminal penalties.

ARTICLE 3 – RECORDS

- 3.01 In accordance with Section 2258.024, the Contractor and its Subcontractors, if any, shall keep a record showing:
 - A. The name and occupation of each worker employed by the Contractor or Subcontractor in the construction of the Work; and
 - B. The actual per diem wages paid to each worker.
- 3.02 This record shall be open at all reasonable hours to inspection by the officers and agents of the OPT.

ARTICLE 4 – ENFORCEMENT

- 4.01 Owner will enforce the provisions of this Contract related to the payment of prevailing wage rates as required by Chapter 2258, Subchapter C.
- 4.02 Owner may be required to withhold money forfeited or required to be withheld under Chapter 2258 from the payments to the Contractor. If required, these amounts will be withheld from payments to the Contractor through a Set-off in accordance with the General Conditions.

END OF SECTION

00 73 46 WAGE DETERMINATION SCHEDULE

"General Decision Number: TX20220061 01/07/2022

Superseded General Decision Number: TX20210061

State: Texas

Construction Type: Heavy

Counties: Hardin, Jefferson and Orange Counties in Texas.

HEAVY CONSTRUCTION PROJECTS (Industrial and Processing Plants, and Refineries)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at www.dol.gov/whd/govcontracts.

Modification Number Publication Date
 0 01/07/2022

* ASBE0022-001 06/28/2021

	Rates	Fringes
Insulator/asbestos worker (includes application of all insulating materials, protective coverings, coatings and finishing to all types of mechanical systems).....	\$ 24.90	15.90

 BRTX0001-009 06/01/2017

	Rates	Fringes
BRICKLAYER.....	\$ 23.02	9.53

 CARP2484-001 01/03/2000

	Rates	Fringes
MILLWRIGHT.....	\$ 19.72	3.73

 SHEE0054-001 04/01/2020

	Rates	Fringes
Sheet metal worker (Including HVAC Duct work).....	\$ 29.70	13.85

 SUTX2000-003 02/11/2000

	Rates	Fringes
ELECTRICIAN (Including Low Voltage wiring).....	\$ 15.20	0.40

LABORER
 Common.....\$ 10.00

PIPEFITTER (Including HVAC
work).....\$ 13.20 0.34

Power Equipment Operator
CRANE.....\$ 15.20 0.40

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

=====

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union, which prevailed in the survey for this classification, which in this example would be Plumbers 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in

the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Division National Office Branch of Wage Surveys. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

END OF SECTION

**STATEMENT OF CITY CHARTER
PROVISION ON CONFLICT OF INTEREST**

The following provisions were adopted in an effort to avoid potential conflict of interest with prospective bidders and City employees or officers in the awarding of City contracts:

1. No officer, elected or appointed, or other employee of the City shall have a financial interest, direct or indirect, or by reason of ownership of stock or share exceeding one percent (1%) in a business entity contracting with the City. Nor shall such officer or employee be financially interested, directly or indirectly, in the sale to the City of any land, materials, supplies or services from such business entity, except on behalf of the City in his official capacity as an officer or employee.
2. Any willful violation of this provision shall constitute malfeasance in office and any officer or employee guilty thereof shall thereby forfeit their office or position.
3. Any violation of this section with the knowledge expressed or implied of the person or business entity contracting with the City shall render the contract involved **null and void**. (Beaumont City Charter, Article XVII, Section 9.)

I, _____ (name)
have read and hereby understand the aforementioned Beaumont City Charter provision prohibiting conflict of interest between City employees or officers and prospective bidders in the award of City contracts. I affirm, to the best of my knowledge and belief, that there is no conflict of interest between the herein stated person or business entity and any City officer or employee if a City contract is awarded. I further state that I have no outside interests that conflict or suggest a potential conflict of interest with the City. I understand that knowledge, express or implied, or concealment of such material fact could nullify and void any such City contract awarded.

If I am awarded this contract, I herein agree to report promptly any further situation that might involve or appear to involve me in any conflict of interest with the City.

SIGNED this the _____ day of _____, 20____.

Name

Title

**GENERAL CONDITIONS OF BIDDING
(Revised 12/13/19)**

FAILURE TO COMPLY WITH THESE GENERAL CONDITIONS OF BIDDING MAY RESULT IN THE BID BEING DISQUALIFIED.

1. BIDDING:

- A. All bids must be on blank forms furnished by the Purchasing Division, and must be written in ink or by typewriter. Pencil quotations will not be considered. The bid must be executed personally by the bidder, or if executed by an agent, a power of attorney or other evidence of his authority to act on behalf of the bidder must accompany the bid. If the bidder is a corporation, the certificate of corporate bidder must be executed under the corporate seal by some duly authorized officer of the corporation other than the officers signing the bid. By execution of the bid, the bidder accepts all general and special conditions of the contract and the specifications.

- B. **TIME & DATE:** Formal bids must be in the office of the City Clerk by 2:00 P.M., local time, on the day bids are due, unless otherwise specified; an early postmark will not suffice. Be sure you have allowed ample time for postal delivery. The City will not be responsible for the delivery of your bid to the office of the City Clerk. If you choose to send your bid by postal delivery then it is recommended that you call the City Clerk's office to verify receipt of your bid prior the bid opening. **Formal bids may NOT be faxed or e-mailed.**

Informal bids are due at the date and time stated in the bid document. **Informal bids may be faxed.**

- C. **WITHDRAWAL OF BID:** A bidder may withdraw his proposal before Council acceptance of his bid without prejudice to himself, by submitting a written request for its withdrawal to the City Clerk.
- D. Bids should show net prices, extensions and net total. In case of conflict between unit price and extensions, the unit price will govern.
- E. No change in price will be considered after bids have been opened.
- F. Unless otherwise specified, any catalog or manufacturer's reference or brand name used in describing an item is merely descriptive, and not restrictive, and is used only to indicate type, style or quality of material desired. If a bidder quotes on an

article other than the one specified, which he considers comparable, the name and grade of said article must be specified in the bid and sufficient specifications and descriptive data must accompany same to permit thorough evaluation. In the absence of these qualifications, he will be expected to furnish the article called for.

- G. If this bid is altered, any erasure or alteration of figures on the item on which the erasure or alteration is made must be initialed by signee of this bid.
- H. Bids will not be considered in cases in which bidder quotes an item price and also an alternate price on the proposed substitute item, except in cases in which alternate bids are called for.
- I. All bids are to be delivered not later than the time stated in the specifications, F.O.B. Beaumont, Texas unless otherwise stated in the specifications and/or bid form.
- J. Bidders are invited to be present at the opening of bids. After opening, bids may be inspected in the Purchasing Division offices.
- K. If there is an honest mistake in the bid, due to clerical errors, and the bidder calls attention thereto promptly, he will not be bound by the bid.
- L. Where the mistake was a result of bidder's negligence, and City has no knowledge of the mistake when bids were opened, and contract awarded, he will not be released and shall be bound by the bid.
- M. If a mistake is not discoverable and verifiable by the City, bidder's incorrect interpretation of Engineering specifications set forth in a construction contract will not release him from his obligations, once a contract has been awarded by City Council and bidder has received notice of such award.
- N. Sealed formal bids due in the City Clerk's office will not be accepted through facsimile equipment.

2. TAXES:

- A. The City is exempt from the Federal Excise and Transportation Tax, and the Limited Sales and Use Tax. Unless the bid form or specification specifically indicates otherwise, the price bid must be net exclusive of the above mentioned taxes, and will be so construed. A vendor desiring refunds of, or exemptions from taxes paid on merchandise accepted by the City must submit the proper forms. The Purchasing Manager, if satisfied as to the facts, will approve or issue the necessary certificates.

3. AWARD:

- A. The City reserves the right to consider and make awards of bids on articles of similar nature that in all respects will serve the purpose for which the purchase is being made. The City reserves the right to be the sole judge as to whether such articles will serve the purpose.
- B. Unless otherwise specified, the City reserves the right to accept or reject in whole or in part any bid submitted or to waive any informality in the best interest of the City.
- C. Contractor is an independent contractor. Award of a contract does not create a joint venture between Contractor and the City.

4. BID DEPOSIT:

- A. No bid deposit will be expected of bidder unless specifications expressly provide otherwise.
- B. When specifications expressly call for a bid deposit, the deposit may be in the form of a cashier's check, cash, a certified check made payable to the City of Beaumont or a bond. The bond shall be executed by a surety authorized by the Texas State Insurance Commission and must be signed by both the surety and the bidder.
- C. When specifications call for a bid deposit, it should be placed in a separate bid envelope and enclosed with your bid. Should your bid deposit not be acceptable to the City, your bid will be returned.

5. DELIVERIES:

- A. Unless otherwise stated in the bid form or specification, deliveries must consist only of new and unused merchandise.
- B. Full fare must be allowed and no charge made for packages.
- C. In the event that deliveries of the supplies covered in the proposal are not made within the number of days specified, or in the event that the supplies delivered are rejected, and are not removed and replaced within the number of days specified in the official notice of rejection, the City reserves the right to purchase said supplied in the open market. Upon any such breach of contract, the City reserves the right to proceed against the successful bidder and/or the surety on this bond for any and all damages occasioned by the breach.

6. REJECTIONS:

- A. Articles not in accordance with samples and specifications must be removed by the bidder at his expense. All disputes concerning quality of supplies

delivered under this proposal will be determined by the City Purchasing Manager or his/her designated representative.

specifications and standards as provided for under the Federal Occupational Safety and Health Act of 1970, as amended and in force at the date hereof.

- B. All articles enumerated in the proposal shall be subject to inspection or delivery by an officer designated for the purpose and if found inferior to the quality called for, or not equal in value to the department's samples, or deficient in weight, measurements, workmanship or otherwise, this fact shall be certified to the Purchasing Manager who shall have the right to reject the whole or any part of the same.

7. BILLING:

- A. All bills are subject to approval by the Purchasing Manager.

8. PATENTS:

- A. The contractor agrees to indemnify and hold harmless the City, the Purchasing Manager, and his/her assistants from all suits and actions of every nature and description brought against it or any of them, for or on account of the use of patented appliances, products or processes, and he shall pay all royalties and charges which are legal and equitable. Evidence of such payment or satisfaction shall be submitted, upon request of the Purchasing Manager, as a necessary requirement in connection with the final estimate for payment in which such patented appliances, products or processes are used.

9. CONDITIONS PART OF BID:

- A. The general conditions of bidding defined herein shall be a part of the attached bid.

10. CONTRACT:

- A. No formal contract will be executed. The following will comprise the contract between the City and the successful bidder:
- i. Notice to Bidders,
 - ii. General Specifications,
 - iii. General conditions of bidding,
 - iv. The Bid Sheet(s),
 - v. Resolution awarding the bid.
- B. In case of conflict, the specifications shall be controlling.

11. OSHA REQUIREMENTS:

- A. The vendor or contractor hereby guarantees to the City of Beaumont, Texas, that all material, supplies and equipment as listed on the proposal, contract or Purchase Order meets the requirements,

12. BIDS:

- A. Bids must remain firm for thirty (30) days from the bid opening date to allow for award by Council, unless otherwise specified.

13. DISCOUNTS:

- A. Prompt payment discounts will be considered in making the award provided the period of the discount offered is sufficient to permit payment within such period in the regular course of business (minimum 10 days). Prompt payment discounts will not be considered for contract purchases.
- B. In connection with any discount offered, time will be computed from the date of receipt of supplies or services or from the date a correct invoice is received, whichever is the later date. Payment is deemed to be made on the date of mailing of the check.

14. DISCLOSURE FORMS:

- A. All forms must be signed and returned with your bid sheet.

15. EXCEPTIONS:

- A. If exceptions are being taken to any part of specifications, have them listed separately on your letterhead and manually sign it.

16. LOCAL BIDDER CONSIDERATION:

- A. Should bids for goods and/or commodities be received from a local vendor and an out of town vendor, a sales tax impact analysis formula shall be applied to the local vendor's bid. If it is determined by its formula that the local vendor's bid generates more sales tax revenue to the City than the difference between the two bids, award may be made to the local vendor.

17. PROTEST PROCEDURES – Any actual or prospective bidder or proposer who believes they are aggrieved in connection with or pertaining to a bid or proposal may file a protest. The protest must be delivered in writing to the Purchasing Manager, in person or by certified mail, return receipt requested, prior to award. The written protest must include:

- A. Name, mailing address, and business phone number the protesting party;

- B. Appropriate identification of the bid or proposal being protested;
- C. A precise statement of the reasons for the protest; and
- D. Any documentation or other evidence supporting the protest and any alleged claims.

The Purchasing Division will attempt to resolve the protest, including at the Purchasing Manager's option, meeting with the protesting party. If the protest is successfully resolved by mutual agreement, written verification of the resolution, with specifics on each point addressed in the protest, will be forwarded to the Chief Financial Officer (CFO).

If the Purchasing Division is not successful in resolving the protest, the protesting party may request, in writing, that the protest be considered by the CFO. Applicable documentation and other information applying to the protest will be forwarded to the CFO, who will promptly review such documentation and information. If additional information is desired, the CFO may notify the necessary party or parties to the protest to provide such information.

If the CFO is not successful in resolving the protest, the CFO may forward to the City Manager a request for review. The decision of the City Manager will be final.

18. PUBLIC INFORMATION ACT:

- A. Texas Government Code, Chapter 552, gives you the right to access government records; and an officer for public information and the officer's agent may not ask why you want them. All government information is presumed to be available to the public. Certain exceptions may apply to the disclosure of the information. Governmental bodies shall promptly release requested information that is not confidential by law, either constitutional, statutory, or by judicial decision, or information for which an exception to disclosure has not been sought.
- B. To request information from this governmental body, please contact:

Tina Broussard, City Clerk
City Hall

Physical Address:

801 Main Street, Suite 125
Beaumont, TX 77701

Mailing Address:

P.O. Box 3827
Beaumont, TX 77704-3827

409-880-3740 Fax
409-880-3745 Phone

clerk.orr@beaumonttexas.gov

- 19. **WEBSITE** – Vendors are responsible for verifying all addenda to specifications downloaded from the City website.
- 20. **INTERLOCAL AGREEMENT** – Successful bidder agrees to extend prices to all entities that have entered into or will enter into joint purchasing interlocal cooperation agreements with the City of Beaumont. The City of Beaumont is a participating member of several interlocal cooperative purchasing agreements, as permitted under Chapter 791 of the Texas Government Code, with certain other political subdivision, authorizing participation in a cooperative purchasing program. The successful vendor may be asked to provide products/services based upon the bid price, to any other participant.
- 21. **FORCE MAJEURE** – Neither the City nor the Contractor shall be required to perform any term, condition or covenant of this contract so long as performance is delayed or prevented by force majeure.
- 22. **FUNDING OUT** – The State of Texas statutes prohibit the obligation and expenditure of public funds beyond the fiscal year for which a budget has been approved. Should, during the term of this contract, funds be withdrawn by the funding authority, a Force Majeure shall be deemed to exist, and this contract may be terminated without penalty or recourse by either party.
- 23. **TERMINATION** – This contract may be terminated by either party upon thirty (30) days' written notice.

END OF SECTION

CORPORATE RESOLUTION

I, _____ Secretary
(Name)

do hereby certify that a meeting of the Board of Directors of:

_____, duly called and held at _____
(Name of Corporation)

_____ in the City of _____,
(Address)

State of _____, on the _____ day of _____, 20____, at which time a quorum was present, the following resolution was duly adopted as the action of the Board, and is now in full force and effect:

Be It Resolved, that _____,
(Name of Individual) (Title)

is hereby empowered and authorized to enter into contract agreements and to sign bid proposals, contracts and other written documents as may be necessary to perform such agreements; and that signature on such documents shall be evidence of the full and complete obligation of the Corporation to the terms and conditions of such Contract Documents.

WITNESS MY hand and Seal of the Corporation this _____ day of _____, 20_____.

(Name of Corporation)

By: _____ Secretary
(Signature)

END OF SECTION



Minority Business Enterprise Policy

The City of Beaumont is committed to encourage and promote the use of Minority Business Enterprises (MBE) in construction and professional service contracts.

The Beaumont City Council adopted a new MBE policy on September 12, 2006. Goals for participation in City construction and professional service contracts are 20% of contracts exceeding \$50,000 and \$25,000, respectively.

To assist the City in meeting its goals, we ask that you make a good faith effort to invite certified MBE's and Historically Underutilized Businesses (HUB) to participate in your bid process.

Please complete and submit with your bid the attached form indicating all certified subcontractors that you plan to use in this project. The successful bidder will be required to submit a final list of subcontractors and amount contracted upon completion of the project.

You may obtain the list of City certified contractors from the

following: City of Beaumont website:

<http://beaumonttexas.gov/departments/purchasing/>

City of Beaumont
Finance Department
P.O. Box 3827
801 Main, Room 320
Beaumont, TX 77701
Phone: 409-880-3183
Fax: 409-880-3132

If you have any questions concerning the inclusion of MBE's in City bids, please call the Purchasing Division.

CITY OF BEAUMONT

MINORITY BUSINESS ENTERPRISE (MBE) PROGRAM

I. POLICY STATEMENT

“Minority Business Enterprise” (MBE), or “Minority Business” means a business in which (a) at least fifty-one percent (51%) is owned by minority members, or in the case of a corporation, at least fifty-one percent (51%) of the stock is owned by minority members; and (b) the management and daily business operations are controlled by one or more such individuals.

It is the policy of the City of Beaumont to involve local Minority-Owned Businesses (MBEs) to the fullest extent allowable by State statute in the procurement process.

In order to maximize the number of certified MBEs, the City will accept the State of Texas certified Historically Underutilized Businesses (HUBs) to meet its utilization goals.

II. ELIGIBILITY & OWNERSHIP

Minority individuals means those individuals who are citizens of the United States (or lawfully admitted permanent residents) who are a member of one the groups listed below:

- A. “Asian-Indian Americans” which includes persons whose origins are from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal.
- B. “Asian-Pacific Americans” which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, and the Northern Marianas.
- C. “Black Americans” which includes persons having origins in any of the Black racial groups of Africa.
- D. “Hispanic Americans” which includes persons of Mexican, Puerto Rican, Central or South America, or other Spanish culture or origin, regardless of race.
- E. “Native Americans” which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians.
- F. American Women, including all women of any ethnicity.

III. MBE DIRECTORY

The City will maintain a directory to facilitate identification of MBEs with capabilities relevant to general contracting requirements and to particular bid solicitations. The directory is available to bidders to assist in their efforts to meet the City’s MBE participation goals.

IV. MBE ELIGIBILITY AND JOINT VENTURES INVOLVING MBEs

To ensure that the MBE program only benefits firms owned and controlled by minority individuals, the City of Beaumont shall certify the eligibility of MBEs by verifying all documentation submitted for MBE certification.

A. Determination of Ownership and Control

1. An eligible MBE shall be an independent business, and

- a. the ownership and control by minority persons shall be real, substantial, continuing, and shall go beyond the pro forma ownership of the firm as reflected in its ownership documents;
- b. the minority owners shall enjoy the customary incidents of ownership and shall share in the risks and profits commensurate with their ownership interests, as demonstrated by an examination of the substance rather than form or arrangements;
- c. recognition of the business as a separate entity for tax or corporate purposes is not necessarily sufficient for recognition as an MBE;
- d. in determining whether a potential MBE is an independent business, the City shall consider all relevant factors, including the date the business was established, the adequacy of its resources for the work of the contract, and the degree to which financial, equipment leasing, and other relationships with non-minority firms vary from industry practice.

2. The City shall safeguard from disclosure to unauthorized persons information that reasonably may be regarded as confidential business information, consistent with federal, State and local law.

V. APPLICATION UPDATE

- A. Once certified, an MBE shall update its submission annually every two (2) years by submitting a new application or certifying that the application on file is still accurate. If at any time there is a change in ownership or control of the firm, the firm shall submit a new application within thirty (30) days of the change.
- B. Failure to renew every two years will result in company being removed from the directory of certified MBE's.

VI. PERCENTAGE GOALS

A. Overall Goals

The overall goal for the City of Beaumont's MBE program is to achieve twenty percent (20%) utilization for construction contracts exceeding \$50,000 and twenty percent (20%) utilization for professional services contracts exceeding \$25,000.

These goals shall not constitute a fixed quota. MBE participation will be calculated

using the total dollar value of the contract awarded.

VII. MAINTENANCE OF RECORDS AND REPORTS

- A. In order to monitor the progress of its MBE program, the City shall maintain a record keeping system which will identify and assess MBE contract awards and projected goals.
- B. These records shall include as a minimum:
 - 1. the number of contracts awarded to MBEs;
 - 2. a description of the general categories of contracts so awarded;
 - 3. the dollar value of contracts so awarded;
 - 4. the percentage of the dollar value of all contracts awarded which were awarded to MBEs.

VIII. DECERTIFICATION PROCEDURE

A. Reasons for Decertification

The City reserves the right to decertify an existing MBE for any of the following reasons:

- 1. the firm's structure has changed to the extent that the business is no longer owned or controlled by an eligible person(s);
- 2. the business is no longer active;
- 3. the business is not financially responsible;
- 4. the business is not competent to do the work for which it was certified in accordance with generally accepted industry standards;
- 5. the firm has refused or failed without good cause to perform the work for which it was certified; and
- 6. the business has failed to comply with the City's recertification process.

END OF SECTION

**CITY OF BEAUMONT
SCHEDULE OF MBE PARTICIPATION**

NAME

<i>CERTIFIED MBE CONTRACTOR</i>	<i>ADDRESS</i>	<i>TYPE OF WORK</i>	<i>AGREED PRICE</i>

The undersigned will enter into a formal agreement with MBE Contractors for work listed in this schedule conditioned upon execution of a contract with the City of Beaumont.

NOTE: 1. This schedule should be submitted with your bid.

SIGNATURE

TITLE

Certificate of Interested Parties Information (Form 1295)

Texas' New Certificate of Interested Parties (Form 1295) – How do you comply?

Does your Firm enter into contracts with governmental entities or state agencies in the state of Texas? If so, then be prepared to determine if you must complete and file a Form 1295 the next time your Firm submits a contract for professional services to be signed by a governmental entity or state agency in the state of Texas. If required to be filed, your contract cannot be approved until it is filed.

On September 1, 2015, §2252.908 of the Texas Government Code became effective. §2251.908 provides that on and after January 1, 2016, a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency. This disclosure requirement applies to contracts with a governmental entity or state agency that either: (1) require an action or vote by the governing body of the entity or agency before the contract may be signed; or, (2) has a value of at least \$1million.

The procedure for complying with this new law is as follows: (1) use the application on the Texas Ethics Commission's website (www.ethics.state.tx.us) to enter the required information to be included on Form 1295; (2) print a copy of Form 1295 and the separate certification of filing that contains a unique certification number; (3) sign the printed copy of Form 1295 and have your signature notarized; (4) file the completed Form 1295 and certification of filing with the governmental entity or state agency with which you are entering into the contract. The governmental entity or state agency then notifies the Texas Ethics Commission of receipt of the Form 1295 and the Texas Ethics Commission then will post the completed Form 1295 on its website for all to see.

CERTIFICATE OF INTERESTED PARTIES**FORM 1295**

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

01 11 00 SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Construct Work as described in the Contract Documents.
 - 1. Provide the materials, equipment, and incidentals required to make the Project completely and fully operable.
 - 2. Provide the labor, equipment, tools, and consumable supplies required for a complete Project.
 - 3. Provide the civil, architectural, structural, mechanical, electrical, instrumentation, and all other Work required for a complete and operable Project.
 - 4. Test and place the completed Project in operation.
 - 5. Provide the special tools, spare parts, lubricants, supplies, or other materials as indicated in the Contract Documents for the operation and maintenance of the Project.
 - 6. The Contract Documents do not indicate or describe all Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Construction Manager.

1.02 DESCRIPTION OF WORK

- A. Work is described in general, non-inclusive terms as:
 - 1. Modifications to Bulk Chemical Storage Facility
 - a. Demolition of tanks, emergency eyewash/showers, and associated piping and appurtenances
 - b. Chemical disposal
 - c. Construction of concrete storage bays with ladders, sumps, and tank pads
 - d. Addition of caustic tanks, sump pump, and associated piping and appurtenances
 - e. Addition of alum tank, sump pump, and associated piping and appurtenances
 - f. Addition of emergency eyewash/showers
 - g. Relocation of sodium chlorite tank
 - h. Removal of existing protective coating on interior concrete of existing containment areas and application of new protective coating on interior concrete of existing and new containment areas.
 - i. Electrical and instrumentation
 - 2. Modifications to Chemical Feed Building
 - a. Demolition and replacement of ammonia day tank and associated piping and appurtenances

- b. Demolition of polymer storage drums, scales, and feed pumps
- c. Addition of polymer storage tank, peristaltic pumps, flow meters, and associated piping and appurtenances
- d. Modification of concrete ramp
- e. Electrical and instrumentation

1.03 WORK UNDER OTHER CONTRACTS

- A. The following items of work are not included in this Contract, but may impact construction scheduling, testing, and startup:

Owner	Description
City of Beaumont	Electrical Building Flood Protection Improvements

- B. Bring any discrepancies in the list to the attention of the Construction Manager. It will be deemed that the Contractor included the more expensive listing in the Contract Price if the Contractor fails to bring any discrepancies to the attention of the Construction Manager prior to executing the Agreement.
- C. Completion of the Work described in this Contract may impact the construction and testing of the items listed above.
- 1. Coordinate construction activities through the Construction Manager.
 - 2. Pay claims for damages which result from the late completion of the Project or any specified Milestones.

1.04 WORK BY OWNER

- A. The Owner has no knowledge of work, other than the Work included in this Contract that may impact construction scheduling, testing, and startup.
- B. Owner will provide normal operation and maintenance of the existing facilities during construction, unless otherwise stated.

1.05 CONSTRUCTION OF UTILITIES

- A. Existing utilities will be used for this Project.
- B. Power and Electrical Services:
- 1. Owner will provide permanent power connections for the Site through the power utility unless indicated otherwise in the Contract Documents.
 - 2. Provide conduit, conductors, pull boxes, manholes, and other appurtenances for the installation of power cable between the property line and the transformer and between the transformer and the main power switch unless the Contract Documents indicate otherwise.
 - 3. Test conductors in accordance with the Specifications and requirements of the power utility and coordinate with the power utility to energize the system when ready.
 - 4. Contractor may use the permanent power source in lieu of temporary power source when permanent power is available at the Site.

- a. Notify Construction Manager and Owner of intent to use the permanent power source.
 - b. Arrange with the power utility and pay the charges for connections and monthly charges for use of this power.
5. Pay for the power consumed until the Project has been accepted as Substantially Complete unless noted otherwise.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 26 00 CHANGE MANAGEMENT

PART 1 - GENERAL

1.01 REQUESTS FOR CHANGE PROPOSAL

- A. Construction Manager will initiate Modifications by issuing a Request for Change Proposal (RCP).
 - 1. Construction Manager and Design Professional will prepare a description of proposed Modifications.
 - 2. Construction Manager will issue the Request for Change Proposal form to Contractor. A number will be assigned to the Request for a Change Proposal when issued.
 - 3. Return a Change Proposal in accordance with Paragraph 1.02 for evaluation by the OPT.

1.02 CHANGE PROPOSALS

- A. Submit a Change Proposal (CP) to the Construction Manager for Contractor initiated changes in the Contract Documents or in response to a Request for Change Proposal. Submit the Change Proposal and attach the forms provided by the Construction Manager.
 - 1. Use the Change Proposal form provided by the Construction Manager.
 - 2. Include with the Change Proposal:
 - a. A complete description of the proposed Modification if Contractor initiated or proposed changes to the OPT's description of the proposed Modification.
 - b. The reason the Modification is requested, if not in response to a Request for a Change Proposal.
 - c. A detailed breakdown of the cost of the change if the Modification requires a change in Contract Price. The itemized breakdown is to include:
 - 1) List of materials and equipment to be installed;
 - 2) Man hours for labor by classification;
 - 3) Equipment used in construction;
 - 4) Consumable supplies, fuels, and materials;
 - 5) Royalties and patent fees;
 - 6) Bonds and insurance;
 - 7) Overhead and profit;
 - 8) Field office costs;
 - 9) Home office cost; and
 - 10) Other items of cost.
 - d. Provide the level of detail outlined in the paragraph above for each Subcontractor or Supplier actually performing the Work if Work is to be provided by a

Subcontractor or Supplier. Indicate appropriate Contractor mark ups for Work provided through Subcontractors and Suppliers. Provide the level of detail outlined in the paragraph above for self-performed Work.

- e. Submit Change Proposals that comply with the General Conditions for Cost of Work.
 - f. Provide a revised schedule. Show the effect of the change on the Project Schedule and the Contract Times.
- B. Submit a Change Proposal to the Construction Manager to request a Field Order.
 - C. A Change Proposal is required for all substitutions or deviations from the Contract Documents.
 - D. Request changes to products in accordance with Section 01 33 02 "Shop Drawings."

1.03 CONSTRUCTION MANAGER WILL EVALUATE THE REQUEST FOR A MODIFICATION

- A. Construction Manager will issue a Modification per the General Conditions if the Change Proposal is acceptable to the Owner. Construction Manager will issue a Change Order or Contract Amendment for any changes in Contract Price or Contract Times.
 - 1. Change Orders and Contract Amendments will be sent to the Contractor for execution with a copy to the Owner recommending approval. A Work Change Directive may be issued if Work needs to progress before the Change Order or Contract Amendment can be authorized by the Owner.
 - 2. Work Change Directives, Change Orders, and Contract Amendments can only be approved by the Owner.
 - a. Work performed on the Change Proposal prior to receiving a Work Change Directive or approval of the Change Order or Contract Amendment is performed at the Contractor's risk.
 - b. No payment will be made for Work on Change Orders or Contract Amendments until approved by the Owner.
- B. Contractor may be informed that the Change Proposal is not approved and construction is to proceed in accordance with the Contract Documents.

1.04 EQUAL NON-SPECIFIED PRODUCTS

- A. The products of the listed manufacturers are to be furnished where the Specifications list several manufacturers and do not specifically list "or equal" or "or approved equal" products. Use of any products other than those specifically listed is a substitution. Follow the procedures in Paragraph 1.05 for a substitution.
- B. Contractor may submit other manufacturers' products that are in full compliance with the Specifications where Specifications list one or more manufacturers followed by the phrase "or equal" or "or approved equal."
 - 1. Submit a Shop Drawing as required by Section 01 33 02 "Shop Drawings" to document that the proposed product is equal or superior to the specified product.

2. Prove that the product is equal. It is not the OPT's responsibility to prove the product is not equal.
 - a. Indicate on a point-by-point basis for each specified feature that the product is equal to the Contract Document requirements.
 - b. Make a direct comparison with the specified manufacturer's published data sheets and available information. Provide this printed material with the Shop Drawing.
 - c. The decision of the Design Professional regarding the acceptability of the proposed product is final.
3. Provide a certification that, in furnishing the proposed product as an equal, the Contractor:
 - a. Has thoroughly examined the proposed product and has determined that it is equal or superior in all respects to the product specified.
 - b. Has determined that the product will perform in the same manner and result in the same process as the specified product.
 - c. Will provide the same warranties and/or bonds as for the product specified.
 - d. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the product into the construction and will waive all claims for additional Work which may be necessary to incorporate the product into the Project which may subsequently become apparent.
 - e. Will maintain the same time schedule as for the specified product.
- C. A Change Proposal is not required for any product that is in full compliance with the Contract Documents. If the product is not in full compliance, it may be offered as a Substitution.

1.05 SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product. Submit a Change Proposal per Paragraph 1.02 along with documents required for a Shop Drawing as required by Section 01 33 02 "Shop Drawings" to request approval of a substitution.
- B. Prove that the product is acceptable as a substitute. It is not the Design Professional's responsibility to prove the product is not acceptable as a substitute.
 1. Indicate on a point-by-point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
 2. Make a direct comparison with the specified Suppliers published data sheets and available information. Provide this printed material with the Shop Drawing.
 3. The decision of the Design Professional regarding the acceptability of the proposed substitute product is final.

- C. Provide a certification that, in making the substitution request, the Contractor:
1. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product;
 2. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the manufacturer of the specified product;
 3. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the Project and will waive all claims for additional Work which may be necessary to incorporate the substituted product into the Project which may subsequently become apparent; and
 4. Will maintain the same time schedule as for the specified product.
- D. Pay for review of substitutions in accordance with Section 01 33 02 "Shop Drawings."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 29 00 APPLICATION FOR PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Submit Applications for Payment for completed Work and for materials and equipment in accordance with the General Conditions, the Supplementary Conditions, the Agreement, and this Section. The Contract Price is to include costs for:
 - 1. Providing the Work in accordance with the Contract Documents;
 - 2. Installing Owner furnished equipment and materials, if any;
 - 3. Providing Work for alternates and allowances, if any;
 - 4. Providing Work for extra work Items, if any and if authorized
 - 5. Commissioning, startup, training, and initial maintenance and operation;
 - 6. Acceptance testing at the manufacturer's facilities or at the Site;
 - 7. All home office overhead costs and expenses, including profit made directly or indirectly from the Project;
 - 8. Project management, contract administration, and field office and field operations staff including supervision, clerical support, and technology system support;
 - 9. Professional services including design fees, legal fees, and other professional services;
 - 10. Bonds and insurance;
 - 11. Permits, licenses, patent fees, and royalties;
 - 12. Taxes;
 - 13. Providing all documentation and Samples required by the Contract Documents;
 - 14. Facilities and equipment at the Site including:
 - a. Field offices, office furnishings, and all related office supplies, software, and equipment,
 - b. Storage facilities for Contractor's use and storage facilities for stored materials and equipment including spare parts storage,
 - c. Shops, physical plant, construction equipment, small tools, vehicles, and technology and telecommunications equipment,
 - d. Safety equipment and facilities to provide safe access and working conditions for workers and for others working at the Site,
 - e. Temporary facilities for power and communications,
 - f. Potable water and sanitation facilities, and
 - g. Mobilization and demobilization for all these facilities and equipment.
 - 15. Products, materials, and equipment stored at the Site or other suitable location in accordance with Section 01 31 00 "Project Management and Coordination";

16. Products, materials, and equipment permanently incorporated into the Project;
 17. Temporary facilities for managing water including facilities for pumping, storage, and treatment as required for construction and protection of the environment;
 18. Temporary facilities for managing environmental conditions and Constituents of Concern;
 19. Temporary facilities such as sheeting, shoring, bracing, formwork, embankments, storage facilities, working areas, and other facilities required for construction of the Project;
 20. Temporary and permanent facilities for protection of all overhead, surface, or underground structures or features;
 21. Temporary and permanent facilities for removal, relocation, or replacement of any overhead, surface, or underground structures or features;
 22. Products, materials, and equipment consumed during the construction of the Project;
 23. Contractor labor and supervision to complete the Project including that provided through Subcontractors or Suppliers;
 24. Correcting Defective Work during the Contract Times, during the Correction Period, or as required to meet any warranty provision of the Contract Documents;
 25. Risk associated with weather and environmental conditions, startup, and initial operation of facilities including equipment, processes, and systems;
 26. Contractor safety programs, including management, administration, and training;
 27. Maintenance of facilities including equipment, processes, and systems until operation is transferred to Owner;
 28. Warranties, extended or special warranties, or extended service agreements;
 29. Cleanup and disposal of any and all surplus materials; and
 30. Demobilization of all physical, temporary facilities not incorporated into the Project.
- B. Include the cost not specifically set forth as an individual payment item but required to provide a complete and functional system in the Contract Price.
 - C. Provide written approval of the surety company providing performance and payment bonds for the Schedule of Values, Application for Payment form, and method of payment prior to submitting the first Application for Payment. Submit approval using the "Consent of Surety Company to Payment Procedures" form provided by the Construction Manager. Payment will not be made without this approval.
 - D. Construction Manager may withhold processing the Applications for Payment if any of the following processes or documentation is not up to date:
 1. Progress Schedule per Section 01 33 05 "Construction Progress Schedule."
 2. Project videos and photographs per Section 01 33 06 "Graphic Documentation."
 3. Record Documents per Section 01 31 13 "Project Coordination."

1.02 SCHEDULE OF VALUES

- A. Divide the Contract Price into an adequate number of line items to allow more accurate determination of the earned value for each line item when evaluating progress payments. Submit a detailed Schedule of Values for the Project at least 10 days prior to submitting the first Application for Payment using forms provided by the Construction Manager.
- B. Do not apply for payment until the Schedule of Values has been approved by the Construction Manager.
- C. Divide the cost associated with each line item in the Schedule of Values into installation and materials components.
 - 1. Installation cost is to include all cost associated with the line item except materials cost.
 - 2. Materials cost is the direct cost (as verified by invoice values) for products, materials, and equipment to be permanently incorporated into the Project associated with the line item.
 - 3. Installation cost is to include all direct costs and a proportionate amount of the indirect costs for the Work associated with each line item. Include costs not specifically set forth as an individual payment item but required to provide a complete and functional system.
 - 4. The sum of materials and installation costs for all line items must equal the Contract Price.
- D. Use each unit price line item in the Agreement as a line item in the Schedule of Values. The sum of materials and installation costs for each line item for unit price contracts must equal the value of the line item in the Agreement. In addition to the installation cost described in Paragraph 1.02.C.3, installation costs for unit price items are to include costs for waste and overages.
 - 1. Installation and materials cost may be left as a single installation component if:
 - a. Contractor does not intend to request payment for stored materials for that line item; or
 - b. Work in the line item will be completed within a single payment period.
 - 2. Provide adequate detail to allow a more accurate determination of the earned value for installation costs, expressed as a decimal fraction of Work completed, for each line item.
 - 3. Installation cost line items may not exceed \$50,000.00. Items that are not subdivided into smaller units may only be included in the Application for Payment when Work on the entire unit is complete.
 - 4. Lump sum items may be divided into an estimated number of units to estimate earned value. The estimated number of units times the cost per unit must equal the lump sum amount for that line item.
 - 5. Include Contractor's overhead and profit in the installation costs each line item in proportion to the value of the line item to the Contract Price.

6. Include cost not specifically set forth as an individual payment item but required to provide a complete and functional system in the Contract Price for each item.
 7. Line items may be used to establish the value of Work to be added or deleted from the Project.
- E. Include a breakdown of both mobilization and demobilization costs in the Schedule of Values. The total cost for both mobilization and demobilization may not exceed 3 percent of the total Contract Price. Payment for mobilization and demobilization will be based on the earned value of Work completed. Payment for these costs will only be made for Work completed for the following:
1. Bonds and insurance;
 2. Transportation and setup for equipment;
 3. Transportation and/or erection of all field offices, sheds, and storage facilities;
 4. Salaries for preparation of documents required before the first Application for Payment; and
 5. Salaries for field personnel directly related to the mobilization of the Project.

1.03 SCHEDULE OF ANTICIPATED PAYMENTS

- A. Submit a schedule of the anticipated Application for Payments showing the anticipated application numbers, submission dates, and the amount to be requested for each Application for Payment on the form provided by the Construction Manager.
- B. Update the schedule of anticipated payments as necessary to provide a reasonably accurate indication of the funds required to make payments each month to the Contractor for Work performed.

1.04 ALTERNATES, ALLOWANCES, AND EXTRA WORK ITEMS

- A. Include line items and amounts for specified alternate Work and allowances for Work in the Agreement, if any, and as described in Section 01 23 10 "Alternates and Allowances."
- B. Include line items and amounts for Extra Work items in the Agreement, if any, and as described in Section 01 29 01 "Measurement and Basis for Payment."

1.05 RETAINAGE AND SET-OFFS

- A. Retainage will be withheld from each Application for Payment per the Agreement.
- B. Reduce payments for set-offs per the General Conditions as directed by the Construction Manager.

1.06 PROCEDURES FOR SUBMITTING AN APPLICATION FOR PAYMENT

- A. Submit a draft Application for Payment to the Construction Manager each month at least 20 days before the date established in the Agreement for Owner to make progress payments. Do not submit Applications for Payment more often than monthly. Review the

draft Application for Payment with the Construction Manager to determine concurrence with:

1. Values requested for materials and equipment, stored or incorporated into the Project as documented by invoices;
 2. The earned value for installation costs for each line item in the Application for Payment form expressed as a percent complete for that line item;
 3. The quantity of Work completed for each unit price item;
 4. Amount of retainage to be held; and
 5. Set-offs included in the Application for Payment.
- B. Submit Applications for Payment to the Construction Manager after agreement has been reached on the draft Application for Payment with the Construction Manager.
- C. Provide all information requested in the Application for Payment form. Do not leave any blanks incomplete. If information is not applicable, enter "N/A" in the space provided.
1. Number each application sequentially and include the dates for the application period.
 2. Complete the "Contract Time Summary" on the Application for Payment form. If "Days Final Completion is (ahead/behind) Schedule" (line q) shows Project is more than 30 days behind schedule, revise the Schedule of Anticipated Payments to correspond to the updated schedule required per Section 01 33 05 "Construction Progress Schedule."
 3. Complete the "Summary of Earned Value and Set-offs" on the Application for Payment form. Show the total amounts for earned value of original Contract performed, earned value for Work on approved Contract Amendments and Change Orders, retainage and set-offs.
 4. Sign and date the Contractor's Certification on the Application for Payment form that all Work, including materials, covered by this Application for Payment have been completed or delivered and stored in accordance with the Contract Documents, that all amounts have been paid for Work, materials, and equipment for which previous Payment has been made by the Owner, and that the current payment amount shown in this Application for Payment is now due.
 5. Include "Attachment A - Tabulation of Earned Value of Original Contract Performed" to show the value of materials stored and successfully incorporated into the Project and the earned value for installation of the Work for each line item in the Application for Payment for Work. Attachment A includes Work on the original Contract Price and on approved Contract Amendments and Change Orders.
 6. Include "Attachment B - Tabulation of Values for Materials and Equipment" to track invoices used to support amounts requested as materials in Attachment A. Enter materials to show the amount of the invoice assigned to each item in Attachment A if an invoice includes materials used on several line items.
 7. Include "Attachment C - Summary of Set-offs" to document set-offs made per the Contract Documents. Show each set-off as it is applied. Show a corresponding line item to reduce the set-off amount if a payment held by a set-off is released for payment.

8. Include "Attachment D - Retainage Calculation" to show method for calculating retainage. The amount of retainage with respect to progress payments is stipulated in the Agreement. Any request for a reduction in retainage must be accompanied by a Consent of Surety to Reduction or Partial Release of Retainage.
 9. Include "Attachment E - EVA Calculation" and the EVA Chart showing the anticipated and actual Total Earned Value of Fees, Work, and Materials. Create a graphic representation (curve) of the anticipated progress on the Project each month. Compare the anticipated cumulative Total Earned Value of Fees, Work, and Materials to the actual Total Earned Value of Fees, Work, and Materials to determine performance on budget and schedule. Adjust the table and curve to incorporate Modifications.
- D. Submit attachments in Portable Document Format (PDF).
1. Generate attachments to the Application for Payment using the Excel spreadsheet provided by the Construction Manager.
 2. Submit PDF documents with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 paper.

1.07 ADJUSTMENTS TO THE SCHEDULE OF VALUES IN THE APPLICATION FOR PAYMENT

- A. Submit a Change Proposal to request any changes to the Schedule of Values incorporated into the Application for Payment once approved. A Field Order will be issued by the Construction Manager to modify the Application for Payment form if approved.
- B. Payment for materials and equipment shown in the Application for Payment will be made for the total of associated invoice amounts, up to the value shown for materials in the Application for Payment for that line item.
 1. If the total amount for invoices for materials and equipment for a line item are less than the amount shown for the materials component of that line item in the Application for Payment, and it can be demonstrated that no additional materials or equipment are required to complete Work described in that item, the difference between the total invoice for materials and equipment and the materials component for that line item can be added to the installation component of that Work item.
 2. Costs for material and equipment in excess of the value shown in the Schedule of Values may not be paid for under other line items.

1.08 CONSTRUCTION MANAGER'S RESPONSIBILITY

- A. Construction Manager will review each draft Application for Payment with Contractor to reach an agreement on the amount to be recommended to Owner for payment. Contractor is to revise the Application for Payment to incorporate changes, if any, resulting from this review process.
- B. Construction Manager will review the Application for Payment to determine that the Application for Payment has been properly submitted and is in accordance with the agreed to draft Application for Payment.

- C. Construction Manager will either recommend payment of the Application for Payment to Owner or notify the Contractor of the reasons for not recommending payment. Contractor may make necessary corrections and resubmit the Application for Payment. Construction Manager will review resubmitted Application for Payment and reject or recommend payment of the Application for Payment to Owner as appropriate.
- D. Construction Manager's recommendation of the Application for Payment constitutes a representation that based on its experience and the information available:
 - 1. The Work has progressed to the point indicated;
 - 2. The quality of the Work is generally in accordance with the Contract Documents; and
 - 3. Requirements prerequisite to payment have been met.
- E. This representation is subject to:
 - 1. Further evaluation of the Work as a functioning whole;
 - 2. The results of subsequent tests called for in the Contract Documents; or
 - 3. Any other qualifications stated in the recommendation.
- F. Construction Manager does not represent by recommending payment that:
 - 1. Inspections made to check the quality or the quantity of the Work as it was performed were exhaustive or extended to every aspect of the Work in progress; or
 - 2. Other matters or issues that might entitle Contractor to additional compensation or entitle Owner to withhold payment to Contractor exist.
- G. Neither Construction Manager's review of Contractor's Work for the purposes of recommending payments nor Construction Manager's recommendation of payment imposes responsibility on the Construction Manager or Owner:
 - 1. To supervise, direct, or control the Work;
 - 2. For the means, methods, techniques, sequences, or procedures of construction, or safety precautions and programs;
 - 3. For Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - 4. To make examinations to ascertain how or for what purposes Contractor has used the monies paid on account of the Contract Price; or
 - 5. To determine that title to the Work, materials, or equipment has passed to Owner free and clear of Liens.

1.09 FINAL APPLICATION FOR PAYMENT

- A. Include adjustments to the Contract Price in the final Application for Payment for:
 - 1. Approved Change Orders and Contract Amendments;
 - 2. Allowances not previously adjusted by Change Order;
 - 3. Deductions for Defective Work that have been accepted by the Owner;
 - 4. Penalties and bonuses;

5. Deduction for all final set-offs; and
 6. Other adjustments if needed.
- B. Construction Manager will prepare a final Change Order reflecting the approved adjustments to the Contract Price which have not been covered by previously approved Change Orders and, if necessary, to reconcile estimated unit price quantities with actual quantities.
 - C. Submit the final Application for Payment per the General Conditions, including the final Change Order. Provide the following with the final Application for Payment:
 1. Evidence of payment or release of Liens on the forms provided by the Construction Manager and as required by the General Conditions.
 2. Consent from surety to final payment.
 - D. Final payment will also require additional procedures and documentation per Section 01 70 00 "Execution and Closeout Requirements."

1.10 PAYMENT BY OWNER

- A. Owner is to pay the amount recommended for monthly payments within 30 days after receipt of the Construction Manager's recommended Application for Payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 29 01 MEASUREMENT AND BASIS FOR PAYMENT

PART 1 - GENERAL

1.01 PAYMENT FOR MATERIALS AND EQUIPMENT

- A. Payment will be made for materials and equipment materials properly stored and successfully incorporated into the Project less the specified retainage.
- B. Provide a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of Liens. Provide documentation of payment for materials and equipment with the next Application for Payment. Remove items from the tabulation of materials and equipment if this documentation is not provided with the next Application for Payment.
- C. Provide evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest.
- D. The Work covered by progress payments becomes the property of the Owner at the time of payment. The Contractor's obligations with regard to proper care and maintenance, insurance, and other requirements are not changed by this transfer of ownership until final acceptance in accordance with the General Conditions.
- E. Payment for materials and equipment does not constitute acceptance of the product.

1.02 MEASUREMENT AND BASIS FOR PAYMENTS ON LUMP SUM ITEMS

- A. Measurement for progress payments is the invoice value for stored materials and the earned value for all other cost for constructing each item. Earned value is expressed as the value of the Work completed divided by the total value of installation cost. The total amount paid will be equal to the total lump sum amount for that item.

1.03 MEASUREMENT AND BASIS FOR PAYMENTS ON UNIT PRICE ITEMS

- A. Measure the Work using the unit of measure indicated in this Section for each unit price line item. Payment will be made only for the actual measured unit and/or computed length, area, solid contents, number, and weight unless other provisions are made in the Contract Documents. Payment on a unit price basis will not be made for Work outside dimensions shown in the Contract Documents.
- B. Payment will be made for the actual quantity of Work completed and for materials and equipment stored during the payment period. Payment amount is the Work quantity measured per Paragraph A above multiplied by the unit price for that line item in the Agreement.

1.04 MEASUREMENT AND BASIS FOR PAYMENT FOR BASE ITEMS

- A. Item A-01 – Mobilization:
 - 1. Measuring for payment is on a lump sum basis. Payment for mobilization will be based on the earned value of Work completed.

- B. Item A-02 – Storm Water Pollution Prevention Plan:
1. Payment will be made at the lump sum bid price and shall be full compensation for design, implementation, and removal of the plan for the duration of the project. The lump sum bid shall also include all costs for filter fabric, inlet protection barriers, stabilized construction entrances, and all other items related to controlling stormwater pollution. Plan shall be prepared in accordance with Section 01 57 00 – “Temporary Controls.” Payment shall be allowed for 25% of the lump sum bid price upon receipt and approval of the plan by the Owner. The remaining 75% of the lump sum bid price shall be paid in equal, monthly installments based on the time remaining to achieve substantial completion.
 2. There will be no measurement for the storm water pollution prevention plan.
- C. Item A-03 – Trench Safety:
1. Payment will be made at the lump sum bid price and shall be full compensation for trench safety in accordance with the Contract Documents.
 2. There will be no measurement for trench safety.
- D. Item A-04 – Structural Modifications to Bulk Chemical Storage Facility;
1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to excavation; backfill and site preparation; construction of concrete storage bays, sumps, and tank pads; and installation of ladders in accordance with the Contract Documents.
 2. There will be no measurement for structural modifications to bulk chemical storage facility.
- E. Item A-05 – Miscellaneous Improvements at Bulk Chemical Storage Facility:
1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to demolition of existing sodium chlorite piping; disposal of chemical; relocation of sodium chlorite tank; demolition of existing emergency eyewash/showers and piping; addition of new emergency eyewash/showers and piping; lighting modifications; and construction of new duct bank in accordance with the Contract Documents.
 2. There will be no measurement for miscellaneous improvements at bulk chemical storage facility.
- F. Item A-06 – Caustic System Improvements at Bulk Chemical Storage Facility:
1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to demolition of existing caustic tanks and associated piping; installation of chemical storage tanks, sump pumps, chemical piping, valves, and appurtenances; and

electrical and instrumentation improvements in accordance with the Contract Documents.

2. There will be no measurement for caustic system improvements at bulk chemical storage facility.

G. Item A-07 – Alum System Improvements at Bulk Chemical Storage Facility:

1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to installation of chemical storage tank, sump pump, chemical piping, valves, and appurtenances; and electrical and instrumentation improvements in accordance with the Contract Documents.
2. There will be no measurement for alum system improvements at bulk chemical storage facility.

H. Item A-08 – Improvements to Ammonia Storage at Chemical Feed Building:

1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to demolition of ammonia day tank and installation of new ammonia day tank, associated piping, valves, and appurtenances in accordance with the Contract Documents.
2. There will be no measurement for improvements to chemical feed building.

I. Item A-09 – Improvements to Polymer System at Chemical Feed Building:

1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to demolition of storage drums and scales, and associated piping, addition of a polymer storage tank, peristaltic pumps, flow meters, and associated valves, piping, flexible tubing, instrumentation, and appurtenances in accordance with the Contract Documents.
2. There will be no measurement for improvements to chemical feed building.

J. Item A-10 – Chemical Feed Building Ramp Modifications:

1. Payment will be made at the lump sum bid price for a complete and in place unit. Payment shall be at the bid price and shall be full compensation for supplying all labor, equipment, and materials to provide a fully functional system, including but not limited to construction of concrete ramp in accordance with the Contract Documents.
2. There will be no measurement for chemical feed building ramp modifications.

K. Item A-11 – Owner Directed Items:

1. Payment shall be determined by the Owner directly. An Owner directed item is an item that may only be used at the discretion of the Owner for changes or unforeseen items that are identified during the construction process. This item may be used in full, in part, or not at all during construction. Requests for payment from this bid item will

not be approved until an executed Change Order document approved by the Owner has been issued.

2. There will be no measurement for owner directed items.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 31 00 PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish resources required to complete the Project in accordance with the Contract Documents and within the Contract Times.
- B. Construct Project in accordance with current safety practices.
- C. Manage Site to allow access to Site and control construction operations.
- D. Construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- E. Provide temporary controls for pollution, management of water, and management of excess earth as required in Section 01 57 00 "Temporary Controls."

1.02 STANDARDS

- A. Perform Work to comply with:
 - 1. Requirements of the Contract Documents;
 - 2. Laws and Regulations; and
 - 3. Specified industry standards.

1.03 DOCUMENTATION

- A. Provide documents in accordance with Section 01 33 00 "Document Management."
- B. Provide copies of Supplier's printed storage instructions prior to furnishing materials or products and installation instructions prior to beginning the installation.
- C. Incorporate field notes, sketches, recordings, and computations made by the Contractor in Record Drawings per Section 01 31 13 "Project Coordination."

1.04 PERMITS

- A. Obtain building permits for the Project from the local authorities having jurisdiction. Building permit fees will be waived by the Owner.
- B. Obtain environmental permits required for construction at the Site.
- C. Provide required permits for transporting heavy or oversized loads.
- D. Provide other permits required to conduct any part of the Work.
- E. Arrange for inspections and certification by agencies having jurisdiction over the Work and include the cost for these inspections and certifications in the Contract Price.
- F. Make arrangements with private utility companies and pay fees associated with obtaining services or inspections.
- G. Retain copies of permits and licenses at the Site and comply with all regulations and conditions of the permit or license.

1.05 SAFETY REQUIREMENTS

- A. Manage safety to protect the safety and welfare of persons at the Site.
- B. Provide safe access to move through the Site. Provide protective devices to warn and protect from hazards at the Site.
- C. Provide safe access for those performing tests and inspections.
- D. Maintain a supply of personal protective equipment for visitors to the Site.
- E. Comply with latest provisions of the Occupational Health and Safety Administration (OSHA) and other Laws and Regulations.
- F. Cooperate with accident investigations. Provide two copies of all reports, including insurance company reports, prepared concerning accidents, injuries, or deaths related to the Project to the Construction Manager as Record Data per Section 01 31 13 "Project Coordination."

1.06 ACCESS TO THE SITE

- A. Maintain access to the facilities at all times. Do not obstruct roads, pedestrian walks, or access to the various buildings, structures, stairways, or entrances. Provide safe access for normal operations during construction.
- B. Provide adequate and safe access for inspections. Leave ladders, bridges, scaffolding, and protective equipment in place until inspections have been completed. Construct additional safe access if required for inspections.
- C. Use roadways for construction traffic only with written approval of the appropriate representatives of each entity. Roadways may not be approved for construction traffic. Obtain written approval to use roads to deliver heavy or oversized loads to the Site. Furnish copies of the written approvals to the Construction Manager as Record Data per Section 01 31 13 "Project Coordination."

1.07 CONTRACTOR'S USE OF THE SITE

- A. Limit the use of Site for Work and storage to those areas designated on the Drawings or approved by the Construction Manager. Coordinate the use of the Site with the Construction Manager.
- B. Provide security at the Site as necessary to protect against vandalism and loss by theft.
- C. Park construction equipment in designated areas only and provide spill control measures as discussed in Section 01 57 00 "Temporary Controls."
- D. Park employees' vehicles in designated areas only.
- E. Obtain written permission of the property owner before entering privately-owned land outside of the Owner's property, rights-of-way, or easements.
- F. Conduct of Contractor's or Subcontractor's Employees:
 - 1. Do not permit alcoholic beverages or illegal substances on the Site. Do not allow persons under the influence of alcoholic beverages or illegal substances to enter or remain on the Site at any time. Persons on Site under the influence of alcoholic

beverages or illegal substances will be permanently prohibited from returning to the Site. Criminal or civil penalties may also apply.

2. Do not allow the use of offensive language or sexual harassment in any form. These actions will cause immediate and permanent removal of the offender from the premises. Criminal or civil penalties may apply.
3. Require workers to wear clothing that is inoffensive and meets safety requirements. Do not allow sleeveless shirts, shorts, or any exceedingly torn, ripped, or soiled clothing to be worn on the Site.
4. Do not allow the use, possession, concealment, transportation, promotion, or sale of the following prohibited items anywhere on the Site:
 - a. Firearms (including air rifles and pistols and BB or pellet guns) and ammunition;
 - b. Bows, crossbows, arrows, bolts, or any other projectile weapons;
 - c. Explosives of any kind, including fireworks;
 - d. Illegal knives;
 - e. Other weapons prohibited by state Laws and Regulations; and
 - f. Any other item that has been designed or intended to be used as a weapon.

No exceptions will be made for the possession of a firearm by a person that has a valid state-issued license to carry a firearm. Remove any of the prohibited items listed above from the Site immediately and permanently. Any person found to be in possession of any prohibited item must also be removed from the Site and may be reported to local law enforcement.

1.08 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Examine the Site and review the available information concerning the Site. Locate utilities, underground facilities, and existing structures. Verify the elevations of the structures adjacent to excavations. Report any discrepancies from information in the Contract Documents to the Construction Manager before beginning construction.
- B. Determine if existing structures, poles, piping, or other utilities at excavations will require relocation or replacement. Prepare a Plan of Action per Section 01 31 13 "Project Coordination." Coordinate Work with local utility company and others for the relocation or replacement.
- C. Protect utilities, underground facilities and existing structures unless they are shown to be replaced or relocated on the Drawings. Restore damaged items to the satisfaction of the Owner and utility or property owner.
- D. Carefully support and protect all structures and/or utilities so that there will be no failure or settlement where excavation or demolition endangers adjacent structures and utilities. Do not take existing utilities out of service unless required by the Contract Documents or approved by the Construction Manager. Notify and cooperate with the utility owner if it is necessary to move services, poles, guy wires, pipelines, or other obstructions.
- E. Protect existing trees and landscaping at the Site. Mark trees that may be removed during construction and review with the Construction Manager for approval before removing.

Protect trees to remain from damage limiting activity, including stockpiling of materials within the drip line of the tree.

- F. Protect buildings from damage when handling material or equipment. Protect finished surfaces, including floors, doors, and jambs. Remove doors and install temporary wood protective coverings over jambs, if needed.

1.09 DISRUPTION TO SERVICES/CONTINUED OPERATIONS

- A. Owner's facilities are to continue in service as usual during the construction unless noted otherwise. Owner or utilities must be able to operate and maintain the facilities. Keep disruptions to existing utilities, piping, process piping, or electrical services to a minimum.
 - 1. Do not restrict access to critical valves, operators, or electrical panels.
 - 2. Do not store material or products inside structures unless authorized by the Construction Manager.
 - 3. Limit operations to the minimum amount of space needed to complete the specified Work.
 - 4. Maintain storm sewers and sanitary sewers in service at all times. Provide temporary service around the construction or otherwise construct the Work in a manner that flow is not restricted.
- B. Provide a Plan of Action in accordance with Section 01 35 00 "Special Procedures" if facilities must be taken out of operation.

1.10 FIELD VERIFICATION

- A. Perform complete field measurements prior to purchasing products or beginning construction for products required to fit existing conditions.
- B. Verify property lines, control lines, grades, and levels indicated on the Drawings.
- C. Verify pipe class, equipment capacities, existing electrical systems, and power sources for existing conditions.
- D. Check Shop Drawings and indicate the actual dimensions available where products are to be installed.
- E. Include field measurements in Record Documents as required in Section 01 31 13 "Project Coordination."

1.11 REFERENCE DATA AND CONTROL POINTS

- A. Construction Manager will provide the following control points:
 - 1. Base line or grid reference points for horizontal control.
 - 2. Benchmarks for vertical control.
- B. Locate and protect control points prior to starting the Work and preserve permanent reference points during construction. Designated control points may be on an existing structure or monument. Do not change or relocate points without prior approval of the Construction Manager. Notify Construction Manager when a reference point is lost,

destroyed, or requires relocation. Replace Project control points on the basis of the original survey. Control points or benchmarks damaged, disturbed or destroyed as a result of the Contractor's negligence will be restored by the Construction Manager. Owner will impose a set-off as compensation for the effort required.

- C. Provide complete engineering layout of the Work needed for construction.
 - 1. Provide competent personnel. Provide equipment including accurate surveying instruments, stakes, platforms, tools, and materials.
 - 2. Provide surveying with accuracy meeting the requirements established for Category 5 Construction Surveying as established in the Manual of Practice of Land Surveying in Texas published by the Texas Society of Professional Surveyors, latest revision.
 - 3. Provide Record Data per Section 01 31 13 "Project Coordination" and measurements per standards.

1.12 DELIVERY AND STORAGE

- A. Deliver products and materials to the Site in time to prevent delays in construction.
- B. Deliver packaged products to Site in original undamaged containers with identifying labels attached. Open cartons as necessary to check for damage and to verify invoices. Reseal cartons and store properly until used. Leave products in original packages or other containers until installed. If original packages or containers are damaged, repackage in containers and include packing slips, labels and other information from the original packaging.
- C. Deliver products that are too large to fit through openings to the Site in advance of the time enclosing walls and roofs are erected. Set in place, raised above floor on cribs or pallets.
- D. Assume full responsibility for the protection and safekeeping of products stored at the Site.
- E. Store products at locations acceptable to the Construction Manager and to allow Owner access to maintain and operate existing facilities.
- F. Store products in accordance with the Supplier's storage instructions immediately upon delivery. Leave seals and labels intact. Arrange storage to allow access for maintenance of stored items and for inspection. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
- G. Provide additional storage areas as needed for construction. Store products subject to damage by elements in substantial weather-tight enclosures or storage sheds. Provide and maintain storage sheds as required for the protection of products. Provide temperature, humidity control, and ventilation within the ranges stated in the Supplier's instructions. Remove storage facilities at the completion of the Project.
- H. Protect the pipe interior. Keep all foreign materials such as dirt, debris, animals, or other objects out of the pipe during the Work.
- I. Provide adequate exterior storage for products that may be stored out-of-doors.

1. Provide substantial platforms, blocking, or skids to support materials and products above ground which has been sloped to provide drainage. Protect products from soiling or staining.
 2. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet materials. Provide ventilation to prevent condensation below covering.
 3. Store loose, granular materials on clean, solid surfaces, or on rigid sheet materials, to prevent mixing with foreign matter.
 4. Provide surface drainage to prevent erosion and ponding of water.
 5. Prevent mixing of refuse or chemically injurious materials or liquids with stored materials.
 6. Pipes and conduits stored outdoors are to have open ends sealed to prevent the entrance of dirt, moisture, and other injurious materials. Protect PVC pipe from ultraviolet light exposure.
 7. Store products to prevent wind damage.
- J. Protect and maintain mechanical and electrical equipment in storage.
1. Provide Supplier's service instructions on the exterior of the package.
 2. Service equipment on a regular basis as recommended by the Supplier. Maintain a log of maintenance services. Submit the log as Record Data per Section 01 31 13 "Project Coordination" when Owner assumes responsibility for maintenance and operation.
 3. Provide power to and energize space heaters for all equipment for which these devices are provided.
 4. Provide temporary enclosures for all electrical equipment, including electrical systems on mechanical devices. Provide and maintain heat in the enclosures until equipment is energized.
- K. Maintain storage facilities. Inspect stored products on a weekly basis and after periods of severe weather to verify that:
1. Storage facilities continue to meet specified requirements;
 2. Supplier's required environmental conditions are continually maintained; and
 3. Products that can be damaged by exposure to the elements are not adversely affected.
- L. Replace any stored item damaged by inadequate protection or environmental controls.
- M. Payment may be withheld for any products not properly stored.

1.13 CLEANING DURING CONSTRUCTION

- A. Provide positive methods to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from discharging into the atmosphere. Control dust and dirt from demolition, cutting, and patching operations.

- B. Clean the Site as Work progresses and dispose of waste materials, keeping the Site free from accumulations of waste or rubbish. Provide containers at the Site for waste collection. Do not allow waste materials or debris to blow around or off of the Site. Control dust from waste materials. Transport waste materials with as few handlings as possible.
- C. Comply with Laws and Regulations. Do not burn or bury waste materials. Remove waste materials, rubbish, and debris from the Site and legally dispose of these at public or private disposal facilities.

1.14 MAINTENANCE OF ROADS, DRIVEWAYS, AND ACCESS

- A. Maintain roads and streets in a manner that is suitable for safe operations of public vehicle during all phases of construction unless the Owner approves a street closing. Do not close public roads overnight. Coordinate and arrange for emergency vehicle access when streets are to be closed.
- B. Submit a Notification by Contractor for Owner's approval of a street closing. The request must state:
 - 1. The reason for closing the street.
 - 2. How long the street will remain closed.
 - 3. Procedures to be taken to maintain the flow of traffic.
- C. Obtain permits and permissions of the entity that owns the road prior to any Work and provide a copy of the permit or permission Record Data per Section 01 31 13 "Project Coordination."
- D. Construct temporary detours, including by-pass roads around construction, with adequately clear width to maintain the free flow of traffic at all times. Maintain barricades, signs, and safety features around the detour and excavations. Maintain barricades, signs, and safety features around the Work in accordance with all provisions of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).
- E. Assume responsibility for any damage resulting from construction along roads or drives.

1.15 BLASTING

- A. Blasting is not allowed for any purpose.

1.16 ARCHAEOLOGICAL REQUIREMENTS

- A. Cease operations immediately and contact the Owner for instructions if historical or archaeological artifacts are found during construction.
- B. Conduct all construction activities to avoid adverse impact of the sites where significant historical or archaeological artifacts are found or identified as an area where other artifacts could be found.
 - 1. Obtain details for working in these areas from regulatory agencies.
 - 2. Maintain confidentiality regarding the site(s) of artifacts.
 - 3. Adhere to the requirements of applicable local, state, and federal Laws and Regulations.

4. Notify the Construction Manager and any local, state, or federal agency as required by applicable Laws and Regulations.
- C. Do not disturb archaeological sites.
 1. Obtain the services of a qualified archaeological specialist to instruct construction personnel on how to identify and protect archaeological finds on an emergency basis.
 2. Coordinate activities to permit archaeological work to take place within the area.
 - a. Attempt to archaeologically clear areas needed for construction as soon as possible.
 - b. Provide a determination of priority for such areas.
- D. Assume responsibility for any unauthorized destruction that might result to such sites by construction personnel, and pay all penalties assessed by state or federal agencies for non-compliance with these requirements.
- E. Contract Times will be modified to compensate for delays caused by such archaeological finds. No additional compensation will be paid for delays.

1.17 ENDANGERED SPECIES RESOURCES

- A. Do not perform any activity that is likely to destroy or adversely modify the habitat or jeopardize the continued existence of a threatened or endangered species as listed or proposed for listing under the Federal Endangered Species Act (ESA) or applicable state Laws and Regulations.
- B. Cease Work immediately in the area of the encounter and notify the Construction Manager if a threatened or endangered species is encountered during construction. Construction Manager will implement actions in accordance with the ESA and applicable state statutes. Resume construction in the area of the encounter when authorized to do so by the Construction Manager.

1.18 COORDINATION

- A. Coordinate the efforts of various trades having interdependent responsibilities for Work.
- B. Conceal ducts, pipes, wiring, and other non-finish items in finished areas, except as otherwise shown. Coordinate locations of concealed items with finish elements. Install access panel or doors where units requiring access for maintenance or operation are concealed behind finished surfaces.
- C. Coordinate architectural reflected ceiling plans with the exact location of items installed in suspended ceilings. Request clarification from the Construction Manager prior to proceeding with fabrication or installation of an item if it appears that a conflict exists.
- D. Coordinate the installation of items to be installed later, including:
 1. Accepted alternates.
 2. Products purchased using allowances.
 3. Work by others.
 4. Owner-supplied, Contractor-installed items.

- E. Sequence, coordinate, and integrate the various elements of mechanical, electrical, and other systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate mechanical and electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction.
 - 4. Coordinate the installation of required supporting devices, sleeves, embedded items, and other structural components to be set in concrete before concrete is placed.
 - 5. Install systems, materials, and equipment to provide the maximum headroom possible where mounting heights are not detailed or dimensioned.
 - 6. Coordinate the connection of systems with exterior underground and overhead utilities and services. Comply with the Laws and Regulations and requirements of franchise service companies. Provide required connection for each service.
 - 7. Install systems, materials, and equipment to conform with approved Shop Drawings, Product Data, and Operation and Maintenance Data. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades. Document changes in the indicated routings in the Record Documents per Section 01 31 13 "Project Coordination."
 - 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
 - 9. Install systems, materials, and equipment to facilitate servicing, maintenance, and repair or replacement of components.
 - 10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

1.19 CUTTING AND PATCHING

- A. Perform cutting, fitting, and patching required to complete the Work or to:
 - 1. Uncover Work to provide for installation of new Work or the correction of Defective Work.
 - 2. Provide routine penetrations of non-structural surfaces for installation of mechanical, electrical, and plumbing Work.
 - 3. Uncover Work that has been covered prior to observation by the Construction Manager.
- B. Submit Notification by Contractor in accordance with Section 01 31 13 "Project Coordination" to the Construction Manager in advance of performing any cutting which affects:
 - 1. Work of any other contractor or the Owner;

2. Structural integrity of any structure or system of the Project;
 3. Integrity or effectiveness of weather exposed or moisture resistant structure or systems;
 4. Efficiency, operational life, maintenance, or safety of any structure or system; or
 5. Appearance of any structure or surfaces exposed occasionally or constantly to view.
- C. Include in request:
1. Location and description of affected Work;
 2. Reason for cutting, alteration, or excavation;
 3. Effect on the Work of any separate contractor or Owner;
 4. Effect on the structural or weatherproof integrity of the Work;
 5. Description of proposed Work, including:
 - a. Scope of cutting, patching, or alteration;
 - b. Trades that will perform the Work;
 - c. Products proposed for use; and
 - d. Extent of refinishing to be performed.
 6. Alternatives to cutting and patching;
 7. Written authorization from any separate Contractor whose Work would be affected; and
 8. Date and time Work will be uncovered or altered.
- D. Inspect existing conditions prior to starting the Work, including elements subject to damage or movement during cutting and patching. Uncover elements where required for an adequate inspection. Notify the Construction Manager of any conditions that negatively impact the ability to perform cutting and patching. Contractor is deemed to have accepted the existing conditions and assumed the risk associated with completing the Work when cutting or patching is started after the inspection.
- E. Provide adequate support to maintain the structural integrity of facilities, structures, or elements that could be affected by cutting, patching or installing new Work. Provide devices and methods to protect facilities, structures, or elements from damage that could be affected by Contractor's efforts. Provide protection from the weather for portions of the Project that may be exposed by cutting and patching.
- F. Make cuts or penetrations using methods that prevent damage to other Work and provide proper surfaces for patching and repairs.
- G. Fit and adjust installed products to comply with specified products, functions, tolerances, and finishes.
- H. Patch or repair facilities, structures or elements to provide completed Work per the Contract Documents.
- I. Fit Work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through the surfaces. Where fire rated separations are penetrated, fill the space around the pipe with

materials with physical characteristics equivalent to fire resistance requirements of penetrated surface. Provide firestop inserts inside pipes, sleeves, ducts, conduit, and other penetrations when required by fire resistance requirements.

- J. Patch finished surfaces and building components using new products specified for the original installation. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to the nearest intersection.
 - 2. For an assembly, refinish the entire unit.

1.20 PRELIMINARY OCCUPANCY

- A. Owner may deliver, install, and connect equipment, furnishings, or other apparatus in buildings or other structures. These actions do not indicate acceptance of any part of the building or structure and does not affect the start of warranties or correction periods.
- B. Protect the Owner's property after installation is complete.
- C. Owner may use any product for testing or to determine that the product meets the requirements of the Contract Documents. This use does not constitute acceptance by OPT. These actions do not indicate acceptance of any part of the product and does not affect the start of warranties or correction periods.

1.21 OCCUPANCY

- A. Owner has the right to occupy or operate any portion of the Project that is ready for use after notifying the Contractor of its intent to do so.
- B. Testing of equipment and appurtenances including specified test periods, training, and startup does not constitute acceptance for operation.
- C. Owner may accept the facility for continued use after startup and testing at the option of the Owner. If acceptance is delayed at the option of the Owner, shut down facilities per approved operation and maintenance procedures.
- D. The execution of bonds is understood to indicate the consent of the surety to these provisions for occupancy of the structures and use of equipment.
- E. Provide an endorsement from the insurance carrier permitting occupancy of the structures and use of equipment during the remaining period of construction.
- F. Conduct operations to ensure the least inconvenience to the Owner and general public.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 31 13 PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Administer contract requirements to construct the Project. Provide documentation per the requirements of this Section. Provide information as requested by the OPT.

1.02 DOCUMENTATION

- A. Provide documents in accordance with Section 01 33 00 "Document Management."

1.03 COMMUNICATION DURING THE PROJECT

- A. Construction Manager is to be the first point of contact for all parties on matters concerning this Project.
- B. Construction Manager will coordinate correspondence concerning:
 - 1. Contract administration;
 - 2. Clarification and interpretation of the Contract Documents;
 - 3. Contract modifications;
 - 4. Observation of Work and testing; and
 - 5. Claims.
- C. Construction Manager will normally communicate only with the Contractor. Any required communication with Subcontractors or Suppliers will only be with the direct involvement of the Contractor.
- D. Direct written communications to the Construction Manager at the address indicated at the pre-construction conference. Include the following with communications as a minimum:
 - 1. Name of the Owner;
 - 2. Project name;
 - 3. Contract title;
 - 4. Project number;
 - 5. Date; and
 - 6. A reference statement.
- E. Submit communications on the forms referenced in this Section or in Section 01 33 00 "Document Management."

1.04 PROJECT MEETINGS

- A. Pre-Construction Conference:
 - 1. Attend a pre-construction conference;
 - 2. The location of the conference will be determined by the Construction Manager;

3. The time of the conference will be determined by the Construction Manager, but will be after the Notice of Award is issued and not later than 15 days after the Notice to Proceed is issued;
 4. The OPT, Contractor's project manager and superintendent, representatives of utility companies, and representatives from major Subcontractors and Suppliers may attend the conference; and
 5. Provide and be prepared to discuss:
 - a. Preliminary construction schedule per Section 01 33 05 "Construction Progress Schedule";
 - b. Preliminary Schedule of Documents per Section 01 33 00 "Document Management";
 - c. Schedule of Values and anticipated schedule of payments per Section 01 29 00 "Application for Payment Procedures";
 - d. List of Subcontractors and Suppliers;
 - e. Contractor's organizational chart as it relates to this Project; and
 - f. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications, and payment requests.
- B. Progress Meetings:
1. Attend meetings with the Construction Manager, Design Professional, and Owner.
 - a. Meet monthly or as requested by the Construction Manager to discuss the Project.
 - b. Meet at the Site or other location as designated by the Construction Manager.
 - c. Contractor's superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
 - d. Notify the Construction Manager of any specific items to be discussed a minimum of 1 week prior to the meeting.
 2. Provide information as requested by the Construction Manager, Design Professional or Owner concerning this Project. Prepare to discuss:
 - a. Status of overall project schedule;
 - b. Contractor's detailed schedule for the next month;
 - c. Anticipated delivery dates for equipment;
 - d. Coordination with the Owner;
 - e. Status of documents;
 - f. Information or clarification of the Contract Documents;
 - g. Claims and proposed modifications to the Contract;
 - h. Field observations, problems, or conflicts; and

- i. Maintenance of quality standards.
- 3. Construction Manager will prepare a record of meeting proceedings. Review the record of the meeting and notify the Construction Manager of any discrepancies within 10 days of the date the record of the meeting is provided. The record will not be corrected after the 10 days have expired. Corrections will be reflected in the record of the following meeting.
- C. Pre-Documentation and Pre-Installation Meetings:
 - 1. Conduct pre documentation and pre installation meetings as required in the individual technical Specifications or as determined necessary by the Construction Manager (for example, instrumentation, roofing, concrete mix design, etc.).
 - 2. Set the time and location of the meetings when ready to proceed with the associated Work. Submit a Notification by Contractor in accordance with Paragraph 1.07 for the meeting 2 weeks before the meeting. OPT must approve of the proposed time and location.
 - 3. Attend the meeting and require the participation of appropriate Subcontractors and Suppliers in the meeting.
 - 4. Construction Manager will prepare a record of meeting proceedings. Review the record of the meeting and notify the Construction Manager of any discrepancies within 10 days of the date the record of the meeting is provided. The record will not be corrected after the 10 days have expired. Corrections will be reflected in the record of the following meeting.
- D. Weekly Coordination Meetings: Meet on a weekly basis with the Construction Manager or designated on-site representative of the OPT to discuss Work planned for the following week, review coordination issues, testing required, or other issues. Records of these meetings are not required.

1.05 REQUESTS FOR INFORMATION

- A. Submit a Request for Information to the Construction Manager to obtain additional information or clarification of the Contract Documents.
 - 1. Submit a separate Request for Information for each item on the form provided by the Construction Manager.
 - 2. Attach adequate information to permit a response without further clarification. Construction Manager will return requests that do not have adequate information to the Contractor for additional information. Contractor is responsible for all delays resulting from multiple reviews due to inadequate information.
 - 3. A response will be made when adequate information is provided. The response will be made on the Request for Information form provided by the Construction Manager.
- B. Response to a Request for Information is given to provide additional information, interpretation, or clarification of the requirements of the Contract Documents, and does not modify the Contract Documents.
 - 1. Submit a Change Proposal per Section 01 26 00 "Change Management" if a contract modification is suggested or required.

- C. Use the Decision Register to document decisions made at meetings and actions to be taken in accordance with Paragraph 1.06.
- D. Use the Action Item Register to document assignments for actions to be taken in accordance with Paragraph 1.06.

1.06 DECISION AND ACTION ITEM REGISTER

- A. Construction Manager will maintain a Decision Register to document key decisions made during meetings, telephone conversations, or visits to the Site using the format provided by the Construction Manager:
 - 1. Review the Decision Register prior to each regular meeting.
 - 2. Report any discrepancies to the Construction Manager for correction or discussion at the next monthly meeting.
- B. Construction Manager will maintain an Action Item Register in conjunction with the Decision Register to track assignments made during meetings, telephone conversations or visits to the Site using the format provided by the Construction Manager:
 - 1. Review the Action Item Register prior to each regular meeting.
 - 2. Report actions taken after the previous progress meeting on items in the register assigned to the Contractor or through the Contractor to a Subcontractor or Supplier to the Construction Manager. Report on status of progress 1 week prior to each progress meeting established in Paragraph 1.04 to allow Construction Manager to update the register prior to the Progress Meetings.
 - 3. Be prepared to discuss the status at each meeting.
- C. Decisions or action items in the register that require a change in the Contract Documents will have the preparation of a Modification as an action items if appropriate. The Contract Documents can only be changed by a Modification.

1.07 NOTIFICATION BY CONTRACTOR

- A. Notify the Construction Manager of:
 - 1. Need for testing;
 - 2. Intent to work outside regular working hours;
 - 3. Request to shut down facilities or utilities;
 - 4. Proposed utility connections;
 - 5. Required observation by Construction Manager, Engineer, or inspection agencies prior to covering Work; and
 - 6. Training.
- B. Provide notification a minimum of 2 weeks in advance in order to allow OPT time to respond appropriately to the notification.
- C. Use the Notification by Contractor form provided by the Construction Manager.

1.08 REQUESTS FOR MODIFICATIONS

- A. Submit requests for Modifications per Section 01 26 00 "Change Management."

1.09 PLAN OF ACTION

- A. Submit a written Plan of Action for approval for shutting down essential services. These include:
 - 1. Electrical power;
 - 2. Control power;
 - 3. Process piping;
 - 4. Process equipment;
 - 5. Communications equipment; and
 - 6. Other designated functions.
- B. Describe the following in the Plan of Action:
 - 1. Scheduled dates for construction;
 - 2. Work to be performed;
 - 3. Utilities, piping, or services affected;
 - 4. Length of time the service or utility will be disturbed;
 - 5. Procedures to be used to carry out the Work;
 - 6. Plan of Action to handle emergencies;
 - 7. List of manpower, equipment, and ancillary supplies;
 - 8. Backups for key pieces of equipment and key personnel;
 - 9. Contingency plan that will be used if the original schedule cannot be met; and
- C. Submit plan 2 weeks prior to beginning the Work.

1.10 RECORD DATA

- A. Submit information required by the Contract Documents that is not related to a product as Record Data using the form provided by the Construction Manager.

1.11 RECORD DOCUMENTS

- A. Maintain one complete set of printed Record Documents at the Site including:
 - 1. Drawings;
 - 2. Specifications;
 - 3. Addenda;
 - 4. Modifications;
 - 5. Product Data and approved Shop Drawings;

6. Construction photographs;
 7. Test Reports;
 8. Clarifications and other information provided in Request for Information responses; and
 9. Reference standards.
- B. Store printed Record Documents and Samples in the Contractor's field office.
1. Record Documents are to remain separate from documents used for construction.
 2. Provide files and racks for the storage of Record Documents.
 3. Provide a secure storage space for the storage of Samples.
 4. Maintain Record Documents in clean, dry, legible conditions, and in good order.
 5. Make Record Documents and Samples available at all times for inspection by the OPT.
- C. Maintain an electronic record of Specifications and Addenda to identify products provided in PDF format.
1. Reference the Product Data number, Shop Drawing number, and O&M manual number for each product and item of equipment furnished or installed.
 2. Reference Modifications by type and number for all changes.
- D. Maintain an electronic record of Drawings in PDF format.
1. Reference the Product Data number, Shop Drawing number, and O&M manual number for each product and item of equipment furnished or installed.
 2. Reference Modifications by type and number for all changes.
 3. Record information as construction is being performed. Do not conceal any Work until the required information is recorded.
 4. Mark drawings to record actual construction.
 - a. Depths of various elements of the foundation in relation to finished first floor datum or the top of walls.
 - b. Horizontal and vertical locations of underground utilities and appurtenances constructed, and existing utilities encountered during construction.
 - c. Location of utilities and appurtenances concealed in the Work. Refer measurements to permanent structures on the surface. Include the following equipment:
 - 1) Piping;
 - 2) Ductwork;
 - 3) Equipment and control devices requiring periodic maintenance or repair;
 - 4) Valves, unions, traps, and tanks;
 - 5) Services entrance;
 - 6) Feeders; and

- 7) Outlets.
 - d. Changes of dimension and detail.
 - e. Changes by Modifications.
 - f. Information in Requests for Information or included in the Decision Register.
 - g. Details not on the original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to Requests for Information.
5. Mark Drawings with the following colors:
- a. Highlight references to other documents, including Modifications in blue.
 - b. Highlight mark ups for new or revised Work (lines added) in yellow.
 - c. Highlight items deleted or not installed (lines to be removed) in red.
 - d. Highlight items constructed per the Contract Documents in green.
6. Submit Record Documents to Construction Manager for review and acceptance 30 days prior to Final Completion of the Project.
- E. Applications for Payment will not be recommended for payment if Record Documents are found to be incomplete or not in order. Final payment will not be recommended without complete Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 00 DOCUMENT MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Submit documentation as required by the Contract Documents and as requested by the Construction Manager.
- B. Use the Project Management Information System (PMIS) provided by the Construction Manager. Software for the PMIS is FNIManager which has the following system requirements:
 - 1. Operating Systems: Windows 7 or later and OS X v10.8 or later.
 - 2. Supported Internet Browsers: Internet Explorer 11.0 or later, Google Chrome 70.0 or later, Firefox 63.0 or later, Safari 11.0 or later, and Microsoft Edge 17.0 or later.
 - 3. Screen Resolution: The recommended screen resolution is 1280 x 1024 or higher. The minimum screen resolution required to support all features is 1024 x 768.

1.02 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Documents not meeting these criteria will be returned without review as “Not Approved.”

1.03 CONTRACTOR’S RESPONSIBILITIES

- A. Review documents prior to submission. Make certifications as required by the Contract Documents and as indicated on Construction Manager provided forms.
- B. Provide a Schedule of Documents to list the documents that are to be submitted, the dates on which documents are to be sent to the Construction Manager for review. Use the form provided by the Construction Manager for this list.
- C. Incorporate the dates for processing documents into the Progress Schedule required by Section 01 33 05 “Construction Progress Schedule.”
 - 1. Provide documents in accordance with the schedule so construction of the Project is not delayed.
 - 2. Allow a reasonable time for the review of documents when preparing the Progress Schedule. Assume a 14-day review cycle for each document unless a longer period of time is indicated in the Contract Documents or agreed to by Construction Manager and Contractor.
 - 3. Schedule delivery of review documents to provide all information for interrelated Work at one time.
 - 4. Allow adequate time for processing documents so construction of the Project is not delayed.

1.04 FORMS AND WORKFLOWS

- A. Use the forms or workflow process provided by the Construction Manager for project documentation.

1.05 DOCUMENT PREPARATION AND DELIVERY PROCEDURES

- A. Deliver documents in electronic format as directed by the Construction Manager.
 - 1. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
 - 2. Deliver all documents in Portable Document Format (PDF).
 - a. Create PDF document using Bluebeam Revu software.
 - b. Create PDF documents from native format files unless files are only available from scanned documents.
 - c. Rotate pages so that the top of each document appears at the top of the monitor screen when opened in PDF viewing software.
 - d. Provide PDF document with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 paper.
 - e. Submit color PDF documents where color is required to interpret the document.
 - f. Create or convert documents to allow text to be selected for comments or searched using text search features. Run scanned documents through Optical Character Recognition (OCR) software if necessary.
 - g. Flatten markups in documents to prevent markups made by Contractor from being moved or deleted. Flatten documents to allow markup recovery.
 - h. Use Bluebeam Revu software to reduce file size using default settings except the option for “Drop Metadata”. Uncheck the “Drop Metadata” box when reducing file size.
 - i. Add footers to each document with the name of the Project.
- B. Software Requirements:
 - 1. OPT and Contractor will each acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the following software formats:

Document	Document Format
Email	.htm, .rtf, or .txt without formatting that impairs legibility of content on screen or in printed copies
Submittals	Bluebeam PDF
Applications for Payment	Bluebeam PDF and Microsoft® Excel
Progress Schedules	PDF and Schedule in Native Format

Document	Document Format
Layouts and drawings to be submitted to Owner for future use and modification.	Autodesk® AutoCAD .dwg format
Document submitted to OPT for future word processing use and modification.	Microsoft® Word
Spreadsheets and data submitted to OPT for future data processing use and modification.	Microsoft® Excel

2. Software will be the version currently published at the time Contract is signed, unless a specific software version is listed in the Supplementary Conditions. Prior to using any updated version of the software required in this Section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or convert to comply with this Paragraph 1.05.B.

1.06 DOCUMENT NUMBERING

- A. Assign a document number to the Contractor originated document to allow tracking of the document during the review process.
 1. Assign the number consisting of a prefix, a sequence number, and a letter suffix. Prefixes will be as follows:

Prefix	Description
AP	Application for Payment
CP	Change Proposal
CTR	Certified Test Report
EIR	Equipment Installation Report
GD	Graphic Documentation
NBC	Notification by Contractor
O&M	Operation and Maintenance Manuals
PD	Product Data
RD	Record Data
RFI	Request for Information
SD	Shop Drawing
SCH	Schedule of Progress

2. Issue sequence numbers in chronological order for each type of document as directed by the Construction Manager.
3. Issue numbers for resubmittals that have the same number as the original document followed by an alphabetical suffix indicating the number of times the same document has been sent to the Construction Manager for processing. For example: SD-025 A represents Shop Drawing number 25 and the letter "A" designates this is the second time this document has been sent for review.
4. Clearly note the document number on each page or sheet of the document.
5. Correct assignment of numbers is essential since different document types are processed in different ways.

- B. Include reference to the Drawing number and/or Specification Section, detail designation, schedule, or location that corresponds with the data submitted on the Document Transmittal form. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.

1.07 DOCUMENTATION

- A. Furnish documents as indicated in Section 01 33 01 "Document Register" or in the individual Specification Sections. Submit documents per the procedures described in the Contract Documents.
- B. Submit documents per the Specification Sections shown in the following table:

Document Type	Specification Section
Application for Payment	01 29 00
Certified Test Report	01 33 02 for approval of product 01 40 00 to demonstrate compliance
Change Management	01 26 00
Equipment Installation Report	01 75 00
Graphic Documentation	01 33 06
Notification by Contractor	01 31 13
Operation & Maintenance Manuals	01 33 04
Product Data	01 33 03
Progress Schedules	01 33 05
Record Data	01 31 13
Request for Information	01 31 13
Schedule of Values	01 29 00
Shop Drawing	01 33 02
Substitutions	01 26 00
Suppliers and Subcontractors	01 31 13 01 33 03

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 01 DOCUMENT REGISTER

[illegible]

01 33 02 SHOP DRAWINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Shop Drawings are required for those products that cannot adequately be described in the Contract Documents to allow fabrication, erection, or installation of the product without additional detailed information from the Supplier.
- B. Submit Shop Drawings as required by the Contract Documents and as reasonably requested by the Construction Manager to:
 - 1. Record the products incorporated into the Project;
 - 2. Provide detailed information for the products proposed for the Project regarding their fabrication, installation, commissioning, and testing; and
 - 3. Allow the Design Professional to advise the Owner if products proposed for the Project by the Contractor conform, in general, to the design concepts of the Contract Documents.
- C. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the review of Shop Drawings, Samples, or mockups.
- D. Submit a Change Proposal per Section 01 26 00 "Change Management" to request modifications to the Contract Documents, including those for approval of "or equal" products when specifically allowed by the Contract Documents or as a substitution for specified products or procedures. Deviations from the Contract Documents can only be approved Change Order or Field Order.

1.02 QUALITY ASSURANCE

- A. Submit legible, accurate, and complete documents presented in a clear, easily understood manner. Shop Drawings not meeting these criteria will not be approved.
- B. Demonstrate that the proposed products are in full compliance with the design criteria and requirements of the Contract Documents or will be if deviations requested per Paragraph 1.11 are approved.
- C. Furnish and install products that fully comply with the information included in the Shop Drawings.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Furnish Shop Drawings for products as indicated in Section 01 33 01 "Document Register" or in the individual Specification Sections.
- B. Include Shop Drawings in the Document Register required by Section 01 33 00 "Document Management" to indicate the Shop Drawings to be submitted, the dates on which Shop Drawings are to be sent to the Construction Manager for review, and proposed dates that the product will be incorporated into the Project.

- C. Incorporate the dates for processing Shop Drawings into the Progress Schedule required by Section 01 33 05 "Construction Progress Schedule."
 - 1. Submit Shop Drawings in accordance with the schedule so construction of the Project is not delayed.
 - 2. Submit Shop Drawings for interrelated Work at one time.
 - 3. Allow adequate time for ordering, fabricating, delivering, and installing products so construction of the Project is not delayed.
- D. Complete the following before submitting a Shop Drawing or Sample:
 - 1. Prepare and review the Shop Drawing or Sample. Coordinate the Shop Drawing or Sample with other Shop Drawings and Samples, with the requirements of the Work, and the Contract Documents;
 - 2. Determine and verify specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to Shop Drawings and Samples;
 - 3. Determine and verify the suitability of materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 4. Determine and verify information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- E. Determine and verify:
 - 1. Field measurements, quantities, and dimensions are shown on the Shop Drawing and are accurate;
 - 2. Location of existing structures, utilities, and equipment related to the Shop Drawing have been shown and conflicts between the products, existing structures, utilities, and equipment have been identified;
 - 3. Conflicts that impact the installation of the products have been brought to the attention of the Construction Manager;
 - 4. Shop Drawing is complete for its intended purpose; and
 - 5. Conflicts between the Shop Drawing related to the various Subcontractors and Suppliers have been resolved.
- F. Review Shop Drawings prior to submitting to the Construction Manager. Certify that all Shop Drawings have been reviewed by the Contractor and are in strict conformance with the Contract Documents as modified by Addenda, Change Order, Field Order, or Contract Amendment when submitting Shop Drawings except for deviations specifically brought to the Construction Manager's attention on an attached Shop Drawing Deviation Request form in accordance with Paragraph 1.11.
- G. Fabrication or installation of any products prior to the approval of Shop Drawings is done at the Contractor's risk. Defective products may be rejected at the Owner's option.

- H. Payment will not be made for products for which Shop Drawings or Samples are required until these are approved by the Construction Manager and Design Professional.

1.04 DOCUMENTATION

- A. Provide adequate information in Shop Drawings and with Samples so the Design Professional can:
 - 1. Assist the Owner in selecting colors, textures, or other aesthetic features.
 - 2. Compare the proposed features of the product with the specified features and advise Owner that the product does, in general, conform to the Contract Documents.
 - 3. Compare the performance features of the proposed product with those specified and advise the Owner that the product does, in general, conform to the performance criteria specified in the Contract Documents.
 - 4. Review required certifications, guarantees, warranties, and service agreements for compliance with the Contract Documents.
- B. Include a complete description of the material or equipment to be furnished, including:
 - 1. Type, dimensions, size, arrangement, model number, and operational parameters of the components;
 - 2. Weights, gauges, materials of construction, external connections, anchors, and supports required;
 - 3. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components;
 - 4. All applicable standards;
 - 5. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings;
 - 6. Wiring and piping diagrams and related controls;
 - 7. Mix designs for concrete, asphalt, or other materials proportioned for the Project; and
 - 8. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the document that the measurements represent actual dimensions obtained at the Site.
- C. Submit Shop Drawings that require coordination with other Shop Drawings for fabrication at the same time. Shop Drawings requiring coordination with other Shop Drawings will not be approved until a complete package is submitted, unless approved by the Construction Manager.
- D. Submit information for all of the components and related equipment required for a complete and operational system in one Submittal.
 - 1. Include electrical, mechanical, and other information required to indicate how the various components of the system function together as a system.
 - 2. Provide certifications, warranties, and written guarantees and service contracts with the document package for review when these are required.

1.05 SPECIAL CERTIFICATIONS AND REPORTS

- A. Provide all required special certifications, reports, and other documentation with the Shop Drawings as specified in the individual Specification Sections which may include:
 - 1. Certified Test Reports (CTR): A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the Specifications. This report is to demonstrate that the product, when installed, will meet the requirements of the Contract Documents and is part of the Shop Drawing. Field tests may be performed by the Owner to determine that in place materials or products meet the same quality as indicated in the CTR submitted as part of the Shop Drawing.
 - 2. Certification of Local Field Service (CLS): A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300-mile radius of the Site. Include the names, addresses, and telephone numbers of approved service organizations with the certificate.
 - 3. Certification of Adequacy of Design (CAD): A certified letter from the manufacturer of the equipment stating that the equipment has been designed to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter must state that mechanical and electrical components have been adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
 - 4. Certification of Applicator/Subcontractor (CSQ): A certified letter stating that the applicator or subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.

1.06 WARRANTIES AND GUARANTEES

- A. Provide all required warranties, guarantees, and related documents with the Shop Drawing. The effective date of warranties and guarantees will be the date of Substantial Completion.
- B. Identify all extended warranties which are defined as any guarantee of performance for the product or system beyond the one-year correction period described in the General Conditions. Issue the warranty certificate in the name of the Owner. Provide a warranty bond for extended warranties if required by the individual Specification Sections.
- C. Include an additional copy of equipment warranties in operation and maintenance manuals.
- D. Provide a copy of all warranties in a separate document in accordance with Section 01 70 00 "Execution and Closeout Requirements."

1.07 EXTENDED SERVICE AGREEMENTS

- A. Provide Extended Service Agreements and related documents with the Product Data. An Extended Service Agreement is a contract between the Owner and an approved Subcontractor or Supplier to provide service and or maintenance beyond that required to

fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond the one-year correction period specified in the General Conditions.

- B. An Extended Service Agreement does not relieve the Contractor from obligations under the one-year correction period or warranty provisions specified in the General Conditions
- C. An Extended Service Agreement does not relieve the Contractor from obligations under the maintenance bond, if a maintenance bond is required by the Contract.
- D. Requirements for the Extended Service Agreement are described in the Specification Sections for each piece of equipment or system requiring an Extended Service Agreement.
- E. Enter into a contract with the service provider and assign the service contract to the Owner on the date Substantial Completion. Once assigned to the Owner, Contract requirements for the Extended Service Agreement will be complete and will not extend the Contract between the Owner and Contractor.
- F. Owner may require that a performance bond be provided for the Extended Service Agreement. Provide a separate bond meeting the same requirements as those for the Contractor's performance bond if required. The bond will be in the amount of the Extended Service Agreement.
- G. Include an additional copy of Extended Service Agreements in operation and maintenance manuals.
- H. Provide a copy of Extended Service Agreements in a separate document in accordance with Section 01 70 00 "Execution and Closeout Requirements."

1.08 SHOP DRAWING SUBMITTAL PROCEDURES

- A. Submit Shop Drawings to the Construction Manager. Send all documents in digital format for processing.
 - 1. Provide all information requested. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
 - 2. Submit all documents in Portable Document Format (PDF) as required by Section 01 33 00 "Document Management." Provide color PDF documents where color is required to interpret the Shop Drawing. Provide Samples and color charts per Paragraph 1.09.
 - 3. Submit each specific product, class of material, or equipment system separately so these can be tracked and processed independently. Do not submit Shop Drawings for more than one independent system in the same Submittal.
 - 4. Submit items specified in different Specification Sections separately unless they are part of an integrated system.
 - 5. Define abbreviations and symbols used in Shop Drawings.
 - a. Use terms and symbols in Shop Drawings consistent with the Contract Drawings.
 - b. Provide a list of abbreviations and their meaning as used in the Shop Drawings.
 - c. Provide a legend for symbols used on Shop Drawings.

6. Mark Shop Drawings to reference:
 - a. Related Specification Sections;
 - b. Drawing number and detail designation;
 - c. Equipment designation or name;
 - d. Schedule references;
 - e. System into which the product is incorporated; and
 - f. Location where the product is incorporated into the Project.
- B. Use the following conventions to markup Shop Drawings for review:
 1. Make comments and corrections in the color blue. Add explanatory comments to the markup.
 2. Highlight items in black (redact) that are not being furnished when the Supplier's standard drawings or information sheets are provided so that only the products to be provided are in their original color.
 3. Make comments in yellow where selections or decisions by the Design Professional are required, but such selections do not constitute a deviation from the Contract Documents. Add explanatory comments to the markup to indicate the action requested of the Design Professional.
 4. Make comments in orange that are deviation requests. Include the deviation request number on the Shop Drawing that corresponds to the deviation request on the Shop Drawing Deviation Request form. Include explanatory comments in the Shop Drawing Deviation Request form.
 5. Mark dimensions with the prefix "FD" to indicate field verified dimensions on the Shop Drawings.
- C. Designate a document as requiring priority treatment to place the review of the Shop Drawing ahead of other Shop Drawings previously delivered. Shop Drawings are typically reviewed in the order received, unless Contractor requests that a different priority be assigned. Priority Shop Drawings will be reviewed before other Shop Drawings already received but not yet reviewed. Use of this priority designation for Shop Drawings may delay the review of Shop Drawings previously submitted. Contractor is responsible for delays resulting from the use of the priority designation status on Shop Drawings.
- D. Complete the certification required by Paragraph 1.03.F.

1.09 SAMPLE AND MOCKUP SUBMITTAL PROCEDURES

- A. Submit color charts and Samples for every product requiring color, texture, or finish selection.
 1. Submit color charts and Samples only after Shop Drawings for the products have been approved.
 2. Deliver all color charts and Samples at one time.
 3. Provide Samples of adequate size to clearly illustrate the functional characteristics of the product, with integrally related parts and attachment devices.

4. Indicate the full range of color, texture, and patterns.
 5. Deliver color charts and Samples to the field office and store for the duration of the Project.
 6. Notify the Construction Manager that color charts and Samples have been delivered for approval using the Notification by Contractor form.
 7. Submit color charts and Samples not less than 30 days prior to when these products are to be ordered or released for fabrication to comply with the Project schedule.
 8. Remove Samples that have not been approved. Submit new Samples following the same process as for the initial Sample until Samples are approved.
 9. Dispose of Samples when related Work has been completed and approved and disposal is approved by the Construction Manager. At Owner's option, Samples will become the property of the Owner.
- B. Construct mockups for comparison with the Work being performed.
1. Construct mockups from the actual products to be used in construction per the detailed specifications.
 2. Construct mockups of the size and in the area indicated in the Contract Documents.
 3. Construct mockups complete with texture and finish to represent the finished product.
 4. Notify the Construction Manager that mockups have been constructed and are ready for approval using the Notification by Contractor form. Allow 2 weeks for Construction Manager to approve of the mockup before beginning the Work represented by the mockup.
 5. Remove mockups that have not been approved. Construct new mockups following the same process as for the initial mockup until mockup is approved.
 6. Protect mockups until Work has been completed and accepted by the Construction Manager.
 7. Dispose of mockups when related Work has been completed and disposal is approved by the Construction Manager.

1.10 REQUESTS FOR DEVIATION

- A. Submit a Change Proposal per Section 01 26 00 "Change Management" to request modifications to the Contract Documents, including those for approval of "or equal" products when specifically allowed by the Contract Documents or as a substitution for specified products or procedures.
- B. Provide a Shop Drawing with the Change Proposal that clearly identifies deviations for any product or component of the product that does not fully comply with the Contract Documents using the Shop Drawing Deviation Request form provided by the Construction Manager. Mark deviations on the Shop Drawing per Paragraph 1.08.B.
- C. Include a description of why the deviation is required and the impact on Contract Price or Contract Times. Include the amount of any cost savings to the Owner for deviations that result in a reduction in cost.

- D. Identify each deviation request as a separate item. Include all requested deviations that must be approved as a group together and identify them as a single item.
- E. Construction Manager will issue a Field Order or Change Order to approve acceptable deviations. Approval of a requested Shop Drawing deviation by the Design Professional on the Shop Drawings Deviation Request form indicates approval of the requested deviation only on its technical merits as generally conforming to the Contract Documents. Deviations from the Contract Documents can only be approved by a Modification issued by the Construction Manager.

1.11 CONSTRUCTION MANAGER AND DESIGN PROFESSIONAL RESPONSIBILITIES

- A. Shop Drawings will be received by the Construction Manager. Construction Manager will log the documents and forward to the Design Professional for review per this Section for general conformance with the Contract Documents.
 - 1. Design Professional's review and approval will be only to determine if the products described in the Shop Drawing or Sample will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 - 2. Design Professional's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 - 3. Design Professional's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
- B. Comments will be made on items called to the attention of the Design Professional for review and comment. Any marks made by the Design Professional do not constitute a blanket review of the document or relieve the Contractor from responsibility for errors or deviations from the Contract requirements.
 - 1. Design Professional will respond to Contractor's markups by either making markups directly in the Shop Drawing file using the color red or by attaching a Document Review Comments form with review comments keyed to the Drawings or Shop Drawing Deviation Request.
 - 2. Shop Drawings that are reviewed will be returned with one or more of the following status designations:
 - a. Approved: Shop Drawing is found to be acceptable as submitted.
 - b. Approved as Noted: Shop Drawing is approved so long as corrections or notations made by Design Professional are incorporated into the Shop Drawing.
 - c. Not Approved: Shop Drawing or products described are not acceptable.
 - d. Cancelled: This action indicates that for some reason, the Shop Drawing is to be removed from consideration and all efforts regarding the processing of that document are to cease.

3. Shop Drawings will also be designated for one of the following actions:
 - a. Documents Filed: Shop Drawing is acceptable without further action and has been filed as a record document.
 - b. Shop Drawing Not Required: A Shop Drawing was not required by the Contract Documents. Resubmit the document per Section 01 33 03 "Product Data."
 - c. Cancelled: This action indicates that for some reason, the Shop Drawing is to be removed from consideration and all efforts regarding the processing of that document are to cease.
 - d. Revise and Resubmit: Shop Drawing has deviations from the Contract Documents, significant errors, or is inadequate and must be revised and resubmitted for subsequent review.

Actions "a" through "c" will close out the Shop Drawing review process and no further action is required as a Shop Drawing. Action "d" requires follow up action to close out the review process.

4. Drawings with a significant or substantial number of markings by the Contractor may be marked "Approved as Noted." These drawings are to be revised to provide a clean record of the document. Proceed with ordering products as the documents are revised.
 5. Dimensions or other data that do not appear to conform to the Contract Documents will be marked as "At Variance With" (AVW) the Contract Documents or other information provided. The Contractor is to make revisions as appropriate to comply with the Contract Documents.
- C. Bring deviations to the Shop Drawings to the attention of the Design Professional for approval by using the Shop Drawing Deviation Request form. Use a single line for each requested deviation so the Status and Action for each deviation can be determined for that requested deviation. If approval or rejection of a requested deviation will impact other requested deviation, then all related deviations should be included in that requested deviation line so the status and action can be determined on the requested deviation as a whole.
 - D. Requested deviations will be reviewed as a possible Modification to the Contract Documents.
 1. A requested deviation will be marked as "Not Approved" if the requested deviation is unacceptable. Contractor is to revise and resubmit the Shop Drawing with corrections for approval.
 2. A Field Order will be issued by the Construction Manager for deviations approved by the Design Professional if the requested deviation is acceptable and if the requested deviation will not result in a change in Contract Price or Contract Times. Requested deviations from the Contract Documents may only be approved by Field Order.
 3. A requested deviation will not be approved if the requested deviation is acceptable but the requested deviation will or should result in a change in Contract Price or Contract Times. Submit any requested deviation that requires a change in Contract

Price or Contract Times as a Change Proposal for approval prior to resubmitting the Shop Drawing.

- E. Contractor is to resubmit a complete Shop Drawing incorporating revisions until it is acceptable and marked "Approved" or "Approved as Noted" and is assigned an action per Paragraph 1.11.B.3 that indicates that the Shop Drawing process is closed.
- F. Information that is submitted as a Shop Drawing that should be submitted as Product Data or other type of document, or is not required may be returned without review, or may be deleted. No further action is required and the Shop Drawing process for this document will be closed.

1.12 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes required by the Design Professional in the document and resubmit to the Construction Manager until approved.
- B. Resubmit a complete Shop Drawing for each resubmittal. The last approved Shop Drawing must not rely on previous submissions. The final Shop Drawing is to provide a complete record for the Owner's records.
- C. Revise initial drawings or data and resubmit as specified for the reviewed document.
 - 1. Highlight or cloud in green those revisions which have been made in response to the previous reviews by the Design Professional. This will include changes previously highlighted or clouded in yellow to direct attention to Design Professional to items requiring selections, decisions by the Design Professional or highlighted or clouded in orange for a requested deviation from the Contract Documents, or comments in red made by the Construction Manager.
 - 2. Highlight and cloud new items in yellow where selections or decisions by the Design Professional are required, but such selections do not constitute a deviation from the Contract Documents. Add explanatory comments to the markup to indicate the action to be taken by the Design Professional.
 - 3. Highlight and cloud new items in orange that are deviation requests. Include the deviation request number on the Shop Drawing that corresponds to the deviation request on the Shop Drawing Deviation Request form. Numbering for these new items is to start with the next number following the last Shop Drawing deviation requested. Include explanatory comments in the Shop Drawing Deviation Request form.
- D. Pay for excessive review of Shop Drawings.
 - 1. Excessive review of Shop Drawings is defined as any review required after the original review has been made and the first resubmittal has been checked to see that corrections have been made.
 - 2. Review of Shop Drawings or Samples will be an additional service requiring payment by the Contractor if the Contractor submits a substitution for a product for which a Shop Drawing or Sample has previously been approved, unless the need for such change is beyond the control of Contractor.
 - 3. Cost for additional review time will be billed to the Owner by the Design Professional for the actual hours required for the review of Shop Drawings by Design Professional

and in accordance with the rates listed in Section 00 73 00 "Supplementary Conditions."

4. A set-off will be included in each Application for Payment to pay the cost for the additional review. The set-off will be based on invoices submitted to the Owner for these services.
5. Need for more than one resubmission or any other delay in obtaining Design Professional's approval of Shop Drawings will not entitle the Contractor to an adjustment in Contract Price or an extension of Contract Times.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 03 PRODUCT DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Submit Product Data as required by the Contract Documents and as reasonably requested by the Construction Manager. Provide Product Data for all products unless a Shop Drawing is required for the same item.
- B. Submit Product Data to provide documents that allow the Owner to:
 - 1. Record the products incorporated into the Project;
 - 2. Record detailed information about products regarding their fabrication, installation, commissioning, and testing; and
 - 3. Provide replacement or repair of products at some future date.
- C. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the receipt or cursory review of Product Data.
- D. Submit a Change Proposal per Section 01 26 00 "Change Management" to request modifications to the Contract Documents, including those for approval of "or equal" products when specifically allowed by the Contract Documents or as a substitution for specified products or procedures. Deviations from the Contract Documents can only be made by an approved Change Order or Field Order.

1.02 QUALITY ASSURANCE

- A. Submit legible, accurate, and complete documents presented in a clear, easily understood manner. Product Data not meeting these criteria will not be accepted and must be resubmitted.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Furnish Product Data for products as indicated in Section 01 33 01 "Document Register" or in the individual Specification Sections.
- B. Include Product Data in the Document Register required by Section 01 33 00 "Document Management" to indicate the Product Data to be submitted, the dates on which documents are to be sent to the Construction Manager for review, and proposed dates that the product will be incorporated into the Project.
- C. Complete the following before submitting Product Data:
 - 1. Prepare Product Data and coordinate with Shop Drawings, Samples, Product Data for related products, and with the requirements of the Contract Documents;
 - 2. Determine and verify specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information;
 - 3. Determine and verify the suitability of materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

4. Determine and verify information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- D. Determine and verify:
1. Field measurements, quantities, and dimensions are shown on the Product Data and are accurate;
 2. Location of existing structures, utilities, and equipment related to the Product Data have been shown and conflicts between the products, existing structures, utilities, and equipment have been brought to the attention of the Construction Manager;
 3. Conflicts that impact the installation of the products have been brought to the attention of the Construction Manager;
 4. Product Data is complete for its intended purpose; and
 5. Conflicts between the Product Data related to the various Subcontractors and Suppliers have been resolved.
- E. Review Product Data prior to submitting to the Construction Manager. Certify that all Product Data has been reviewed by the Contractor and is in strict conformance with the Contract Documents as modified by Addenda, Change Order, Field Order, or Contract Amendment when submitting Product Data.

1.04 DOCUMENTATION

- A. Include a complete description of the material or equipment to be furnished, including:
1. Type, dimensions, size, arrangement, model number, and operational parameters of the components;
 2. Weights, gauges, materials of construction, external connections, anchors, and supports required;
 3. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components;
 4. All applicable standards;
 5. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings;
 6. Wiring and piping diagrams and related controls;
 7. Mix designs for concrete, asphalt, or other materials proportioned for the Project; and
 8. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the document that the measurements represent actual dimensions obtained at the Site.
- B. Submit information for all components and related equipment required for a complete and operational system in one submittal.
1. Include electrical, mechanical, and other information required to indicate how the various components of the system function together as a system.

2. Provide certifications, warranties, and written guarantees and service contracts with the document package for review when these are required.

1.05 SPECIAL CERTIFICATIONS AND REPORTS

- A. Provide all required certifications with the Product Data as specified in the individual Specification Sections:
 1. Certified Test Reports (CTR): A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the Specifications. This report is to demonstrate that the product when installed will meet the requirements of the Contract Documents and is part of the Product Data. Field tests may be performed by the Owner to determine that in place materials or products meet the same quality as indicated in the CTR submitted as part of the Product Data.
 2. Certification of Local Field Service (CLS): A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300-mile radius of the Site. Include the names, addresses, and telephone numbers of approved service organizations with the certificate.
 3. Certification of Adequacy of Design (CAD): A certified letter from the manufacturer of the equipment stating that the equipment has been designed to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter must state that mechanical and electrical components have been adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
 4. Certification of Applicator/Subcontractor (CSQ): A certified letter stating that the applicator or subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.

1.06 WARRANTIES AND GUARANTEES

- A. Provide all required warranties, guarantees, and related documents with the Product Data. The effective date of warranties and guarantees will be the date of Substantial Completion.
- B. Identify all Extended Warranties which are defined as any guarantee of performance for the product or system beyond the one-year correction period described in the General Conditions. Issue the warranty certificate in the name of the Owner. Provide a warranty bond for extended warranties if required by Specification Sections.
- C. Include an additional copy of equipment warranties in operation and maintenance manuals.
- D. Provide a copy of all warranties in a separate document in accordance with Section 01 70 00 "Execution and Closeout Requirements."

1.07 EXTENDED SERVICE AGREEMENTS

- A. Provide Extended Service Agreements and related documents with the Product Data. An Extended Service Agreement is a contract between the Owner and an approved

Subcontractor or Supplier to provide service and or maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond the one-year correction period specified in the General Conditions.

- B. An Extended Service Agreement does not relieve the Contractor from obligations under the one-year correction period or Warranty provisions specified in the General Conditions
- C. An Extended Service Agreement does not relieve the Contractor from obligations under the maintenance bond, if a maintenance bond is required by the Contract.
- D. Requirements for the Extended Service Agreement are described in the Specification Sections for each piece of equipment or system requiring an Extended Service Agreement.
- E. Enter into a contract with the service provider and assign the service contract to the Owner on the date of Substantial Completion. Once assigned to the Owner, Contract requirements for the Extended Service Agreement will be complete and will not extend the Contract between the Owner and Contractor.
- F. Owner may require that a performance bond be provided for the Extended Service Agreement. Provide a separate bond meeting the same requirements as those for the Contractor's performance bond if required. The bond will be in the amount of the Extended Service Agreement.
- G. Include an additional copy of Extended Service Agreements in operation and maintenance manuals.
- H. Provide a copy of Extended Service Agreements in a separate document in accordance with Section 01 70 00 "Execution and Closeout Requirements."

1.08 PRODUCT DATA SUBMITTAL PROCEDURES

- A. Submit Product Data to the Construction Manager. Send all documents in digital format for processing.
 - 1. Provide all information requested. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
 - 2. Submit all documents in Portable Document Format (PDF) as required by Section 01 33 00 "Document Management." Provide color PDF documents where color is required to interpret the Product Data.
 - 3. Submit each specific product, class of material, or equipment system separately so these can be tracked and processed independently. Do not submit Product Data for more than one system in the same Submittal.
 - 4. Submit items specified in different Specification Sections separately unless they are part of an integrated system.
 - 5. Define abbreviations and symbols used in Product Data.
 - a. Use terms and symbols in Product Data consistent with the Contract Drawings.
 - b. Provide a list of abbreviations and their meaning as used in the Product Data.
 - c. Provide a legend for symbols used on Product Data.

6. Mark Product Data to reference:
 - a. Related Specification Sections;
 - b. Drawing number and detail designation;
 - c. Equipment designation or name;
 - d. Schedule references;
 - e. System into which the product is incorporated; and
 - f. Location where the product is incorporated into the Project.
- B. Complete the certification required by Paragraph 1.03.E.

1.09 CONSTRUCTION MANAGER AND DESIGN PROFESSIONAL RESPONSIBILITIES

- A. Product Data will be received by the Construction Manager, logged, and provided to Owner as the Project record.
 1. Product Data may be reviewed to see that the information provided is adequate for the purpose intended. Product Data not meeting the requirements of Paragraph 1.02 may not be approved.
 2. Product Data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.
 3. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the review of Product Data. Contract modifications can only be approved by a Change Order or Field Order.
- B. Construction Manager may take the following action in processing Product Data:
 1. File Product Data as received if the cursory review indicates that the document meets the requirements of Paragraph 1.02. Document will be marked "Filed as Received" and "Documents Filed." No further action is required on that Product Data.
 2. Not approve the Product Data for one of the following reasons:
 - a. The documentation requirements of the Contract Documents indicate that the document submitted as Product Data should have been submitted as a Shop Drawing. The Product Data will be marked "Not Approved" and "Submit as Shop Drawing". No further action is required on this document as Product Data and the Product Data process will be closed. Resubmit the document as a Shop Drawing per Section 01 33 02 "Shop Drawings."
 - b. The cursory review indicates that the document does not meet the requirements of Paragraph 1.02. The Product Data will be marked "Not Approved" and "Revise and Resubmit". Contractor is to resubmit the Product Data until it is acceptable and marked "Filed as Received". When Product Data is filed, no further action is required and the Product Data process will be closed.
 - c. The Product Data is not required by the Contract Documents nor is applicable to the Project. The Product Data will be marked "Not Approved" and "Cancelled." No further action is required and the Product Data process will be closed.

- C. Contractor is to resubmit the Product Data until it is acceptable and marked "Filed as Received".

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 04 OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare a complete and detailed operation and maintenance manual (manual) for each type and model of equipment or product furnished and installed under this Contract.
- B. Prepare manuals in the form of an instruction manual for the Owner. The manuals are to be suitable for use in providing the operation and maintenance instructions required by Section 01 79 00 "Training of Operation and Maintenance Personnel."
- C. Provide complete and detailed information specifically for the products or systems provided for this Project. Include the information required to operate and maintain the product or system.
- D. Manuals are to be provided in addition to any information packed with or attached to the product when delivered. Remove information packed with or attached to the product and include this information as an attachment to the manual.
- E. Include cost for manuals provided by Suppliers and Subcontractors as described in this Section in the Cost of Work for that equipment item.

1.02 DOCUMENTATION

- A. Submit manuals in accordance with Section 01 33 00 "Document Management." Attach a copy of the Operation and Maintenance Manual Review Report form provided by the Construction Manager to each manual with pertinent information completed.
- B. Provide one preliminary electronic copy of the manual to the Construction Manager for review within 15 days after review of any equipment submittal by the OPT.
- C. Provide one electronic copy and three printed copies of the final manual after:
 - 1. Preliminary manuals have been approved;
 - 2. Field test records have been incorporated into the manual; and
 - 3. Record Documents per Section 01 31 13 "Project Coordination" have been approved and have been incorporated in the final manual.
- D. Provide copies of the manufacturer's warranties, guarantees, or service agreements in accordance with Section 01 70 00 "Execution and Closeout Requirements."

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide digital files for each manual as specified in Paragraph 2.02.
 - 1. Use filenames that correspond to the equipment designation shown in the Contract Documents or other equipment designations provided by the OPT.
 - 2. Submit a preliminary version of the electronic manual for review. Provide a final version of the manual incorporating OPT's comments.

- B. Provide printed copies of each manual as specified in Paragraph 2.03.

2.02 ELECTRONIC MANUAL FORMAT

- A. Manual contents are to be submitted in electronic format to the Construction Manager.
- B. Provide individual electronic files for each manual.
 - 1. Maximum file size is 75 MB. If manual is greater than maximum allowable file size, provide individual files for each major section of manual.
 - 2. Acceptable file types for written documents are Portable Document File (PDF) or provide manual text in Microsoft Word. Provide drawings in native format and PDF format. All files must be compatible with the latest software version available.
 - 3. Filename must identify the equipment location, equipment manufacturer, and date equipment placed in service, e.g. JCC1-Pump Room-Manufacturer-200503.pdf.
 - 4. Each electronic file must contain a table of contents at the beginning of the file which includes hypertext links or bookmarks to navigate the file contents per section/chapter.
 - 5. Scanned images of written documents are not acceptable. Document must allow character selection. Text within a file must be transferable to other documents.
 - 6. Drawing files must have the ability to turn on/off drawing layers within the file.

2.03 PRINTED MANUAL FORMAT

- A. Printed copies of each manual are to be submitted as follows:
 - 1. Print manuals on heavy, first quality 8-1/2 x 11 paper.
 - a. Reduce drawings and diagrams to 8-1/2 x 11 paper size.
 - b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector designed for three-ring binder use. Provide a typed identification label on each sheet protector.
 - c. Punch paper for standard three-ring binders.
 - 2. Place manuals in heavy duty presentation, d-ring binders with clear front, back, and spine covers.
 - 3. Identify each manual by placing a printed cover sheet in the front cover of the binder and as the first page in the manual. The first page is to be placed in a clear polypropylene sheet protector. The information on first page and the cover page are to include:
 - a. Name of Owner;
 - b. Project name;
 - c. Volume number; and
 - d. Table of contents.
 - 4. Insert the name of the Project and volume number into the spine covers.

5. Sheet lifters are to be provided.
6. Minimum size is 2-inch capacity. Maximum size is 3-inch capacity. Fill binders to only three-fourths of its indicated capacity to allow for addition of materials to each binder by the Owner.
7. Provide index tabs for each section of the manual. Indexes are to be constructed of heavy-duty paper with a reinforced binding edge. The designation on each index tab is to correspond to the number and letter assigned in the Table of Contents.
8. Manuals for several products or systems may be provided in the same binder. Correlate the data into related groups when multiple products or systems are included in the same binder.
 - a. Sections for each product or system must be included in the same binder.
 - b. Sections must be in numerical order from volume to volume.

PART 3 - EXECUTION

3.01 MANUAL ORGANIZATION AND CONTENTS

- A. Provide a table of contents listing each section of the manual for each product or system.
 1. Assign a number and letter to each section in the manual.
 - a. The number is to correspond to the Owner's equipment numbering system or other system designated in the Contract Documents.
 - b. The letter assigned will represent the part of the manual, consistent with the manual contents as required by this Section.
 2. Identify each product or system using the nomenclature shown in the Contract Documents. Provide a cross reference to the Owner's numbering system and designations for equipment indicated in the Contract Documents if these are different.
- B. Include only the information that pertains to the product described. Annotate each sheet to:
 1. Clearly identify the specific product or component installed;
 2. Clearly identify the data applicable to the installation; and
 3. Delete or strike through references to inapplicable information.
- C. Supplement manual information with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.
- D. Manuals for several products or systems may be provided in the same binder.
- E. Fill binders to only three-fourths of its indicated capacity to allow for addition of information by the Owner.

3.02 EQUIPMENT AND SYSTEMS MANUAL CONTENT

- A. Provide the following information in the first tabbed section of each manual:
 1. A description of the unit and component parts and how it functions.

2. Operating instructions for pre-startup, startup, normal operations, regulation, control, shutdown, emergency conditions, and limiting operating conditions.
 3. The sequence of operation by the controls manufacturer. Provide control diagrams by the manufacturer, modified to reflect the as-built, as-installed condition.
 4. Include general assembly contract drawings, sections, and photographic views as necessary to completely depict and properly identify the equipment. Indicate the dimensions, weight, capacity, and design conditions for the equipment.
- B. Include detailed information to allow for the proper installation, calibration, testing, preventative, and corrective maintenance procedures in the second section of the manual or of each section of the manual information if the manual covers a multi-component equipment system. This information should include the following:
1. Maintenance instructions including assembly, installation, alignment, clearances, tolerances, and interfacing equipment requirements, adjustment, and checking instructions. Include any special rigging required to place the equipment into place, and any special test equipment required to place the equipment in service.
 2. A safety subsection which addresses all safety and tag-out procedures necessary to safely operate and maintain the equipment.
 3. Lubrication schedule and lubrication procedures. Include a cross reference for recommended lubrication products.
 4. Troubleshooting guide.
 5. A table showing the schedule of routine maintenance requirements and seasonal work which is not performed at a set frequency. Preventative maintenance tasking must address:
 - a. Daily/weekly inspections performed by operations personnel;
 - b. Routine preventative maintenance scheduled weekly, monthly, quarterly, semi-annually, or annually through major overhauls by maintenance personnel; and
 - c. Predictive maintenance work such as alignment, analysis of the equipment, vibration, flow, oil sampling, etc.
 6. Description of sequence of operation by the control manufacturer.
 7. Warnings for detrimental maintenance practices.
 8. Detailed corrective maintenance procedures including:
 - a. Detail equipment for complete disassembly and assembly;
 - b. Cross-sectional drawings or exploded views with all parts numbered to correspond with the numbers in the parts list to permit identification of the various parts;
 - c. A table of normal clearances, diameters, thickness of new parts, and limits permissible for wearing parts; and
 - d. List torque settings for nuts, bolts, and fasteners when critical to the equipment's performance.

- C. Include all necessary diagrammatic piping and wiring diagrams and miscellaneous contract drawings and equipment in the third section of the manual or of each section of the manual if the manual covers a multi-component equipment system.
- D. Provide spare parts information in the fourth section of the manual including:
 - 1. Part numbers for ordering new parts;
 - 2. Assembly illustrations showing an exploded view of the complex parts of the product;
 - 3. Predicted life of parts subject to wear;
 - 4. List of the manufacturer's recommended spare parts, current prices with effective date, and number of parts recommended for storage;
 - 5. Directory of a local source of supply for parts with company name, address, and telephone number;
 - 6. Complete nomenclature and list of commercial replacement parts; and
 - 7. Complete list of spare parts, spare equipment, tools, and materials that are turned over to the Owner.
- E. Provide statistical information from the original equipment manufacturer as to performance such as pump curves, flow charts insulation resistance, calibration, or test data sheets in the fifth section of the manual, including all field testing records used to verify actual performance.
- F. Provide equipment name plate data installed on equipment and valves and equipment data sheets as required and furnished by the Owner in the sixth section of the manual.
- G. Provide a copy of warranties and the date the warranty expires for equipment in the seventh section of the manual.

3.03 ELECTRICAL AND ELECTRONICS SYSTEMS MANUAL

- A. Provide all of the information listed in Paragraph 3.02 as appropriate and include the following information:
 - 1. Control schematics and point to point wiring diagrams prepared for field installation;
 - 2. Circuit directories of panel boards and terminal strips and as installed color coded wiring diagrams; and
 - 3. Other information as may be required by the individual Specification Sections.

3.04 ARCHITECTURAL PRODUCTS MANUAL

- A. Provide the following information:
 - 1. Information required for ordering replacement products;
 - 2. Instructions for care and maintenance;
 - 3. List of the manufacturer's recommended lubricants;
 - 4. The manufacturer's recommendations for types of cleaning agents and methods;

- 5. Cautions against cleaning agents and methods that are detrimental to the product;
and
- 6. Recommended maintenance and cleaning schedule.
- B. Final balancing reports for mechanical systems.
- C. Other information as may be required by the individual Specification Sections.

3.05 LIST OF SERVICE ORGANIZATIONS

- A. Provide a directory of authorized service organizations with company name, address, telephone number, email address, and the contact person for warranty repair.

END OF SECTION

01 33 05 CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare and submit a Progress Schedule for the Work and update the schedule on a monthly basis for the duration of the Project.
- B. Provide Progress Schedule in adequate detail to allow Owner to monitor progress and to relate submittal processing to sequential activities of the Work.
- C. Incorporate Contract Milestones into the schedule and show activities leading to achievement of these milestones.
- D. Assume complete responsibility for maintaining the progress of the Work per the Progress Schedule submitted.

1.02 DOCUMENTATION

- A. Submit the schedules to the Construction Manager. Send all documents in digital format for processing.
- B. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
- C. Provide schedules, schedule updates and revisions to the Construction Manager in electronic format in its originating software and in Portable Document Format (PDF) as required by Section 01 33 00 "Document Management."
- D. Submit a preliminary Progress Schedule at the pre-construction conference.
- E. Submit a detailed Progress Schedule at least 10 days prior to the first payment request.
- F. Submit Progress Schedule updates monthly within 10 days after submitting Applications for Payment to indicate the progress made on the Project to the closing date for the Application for Payment. Failure to submit Progress Schedules will cause delay in the review and approval of subsequent Applications for Payment.

1.03 PROGRESS SCHEDULE REQUIREMENTS

- A. Progress Schedule is to be in adequate detail to:
 - 1. Ensure adequate planning, scheduling, and reporting during the execution of the Work;
 - 2. Ensure the coordination of the Work of the Contractor and the various Subcontractors and Suppliers;
 - 3. Monitor the progress of the Work; and
 - 4. Evaluate the impact of proposed changes to the Contract Times and Project Schedule.
- B. Provide personnel with 5 years' minimum experience in scheduling construction work comparable to this Project. Prepare the Progress Schedule using acceptable scheduling software.

- C. Provide the Progress Schedule in the form of a computer-generated critical path schedule which includes Work to be performed on the Project. It is intended that the Progress Schedule accomplish the following:
1. Give early warning of delays in time for correction.
 2. Provide detailed plans for the execution of the Work in the form of future activities and events in sequential relationships.
 3. Establish relationships of significant planned Work activities and provide a logical sequence for planned Work activities.
 4. Provide continuous current status information.
 5. Allow analysis of the Contractor's program for the completion of the Project.
 6. Permit schedules to be revised when the existing schedule is not achievable.
 7. Log the progress of the Work as it actually occurs.
- D. Provide a time-scaled horizontal bar chart which indicates graphically the Work scheduled at any time during the Project. The chart is to indicate:
1. Complete sequence of construction by activity;
 2. Identification of the activity by structure, location, and type of Work;
 3. Chronological order of the start of each item of Work;
 4. The activity start and stop dates;
 5. The activity duration; and production rates used to determine the duration;
 6. Successor and predecessor relationships for each activity;
 7. A clearly indicated single critical path; and
 8. Projected percentage of completion, based on dollar value of the Work included in each activity as of the first day of each month.
- E. Provide a Progress Schedule for Submittals:
1. Indicate the specific dates each document is to be delivered to the Construction Manager.
 2. Allow a reasonable time to review each document, taking into consideration the size and complexity of the document, other documents being processed, and other factors that may affect review time.
 3. Include time for making revisions to the Shop Drawings and resubmitting the Shop Drawing for at least a second review.
 4. Assume a 14-day review cycle for each time a Shop Drawing is submitted for review unless a longer period is indicated in the Contract Documents or provided by the Construction Manager.
 5. Contractor is responsible for delays associated with additional time required to review incomplete or erroneous documents and for time lost when documents are submitted for products that do not meet specification requirements.

1.04 PROGRESS SCHEDULE REVISIONS

- A. Revise the Progress Schedule if it appears that the schedule no longer represents the actual progress of the Work.
 - 1. Submit a Plan of Action for schedule recovery if the Progress Schedule or earned value analysis indicates that the Project is more than 30 days behind schedule. The report is to include:
 - a. Number of days behind schedule;
 - b. Narrative description of the steps to be taken to bring the Project back on schedule; and
 - c. Anticipated time required to bring the Project back on schedule.
 - 2. Submit a revised Progress Schedule indicating the action that the Contractor proposes to take to bring the Project back on schedule.
- B. Revise the Progress Schedule to indicate any adjustments in Contract Times approved by a Modification.
 - 1. Include a revised Progress Schedule with Change Proposals if a change in Contract Times is requested.
 - 2. Construction Manager will deem any Change Proposal that does not have a revised Progress Schedule and request for a change in Contract Times as having no impact on the ability of the Contractor to complete the Project within the Contract Times.
- C. Updating the Progress Schedule to reflect actual progress is not considered a revision to the schedule.
- D. Applications for Payment will not be recommended for payment without a revised Progress Schedule and if required, the report indicating the Contractor's plan for bringing the Project back on schedule.

1.05 FLOAT TIME

- A. Define float time as the amount of time between the earliest start date and the latest start date of a chain of activities on the construction schedule.
- B. Float time is not for the exclusive use or benefit of either the Contractor or Owner.
- C. Where several subsystems each have a critical path, the subsystem with the longest time of completion is the critical path and float time is to be assigned to other subsystems.
- D. Schedule completion date must be the same as the Contract completion date. Time between the end of construction and the Contract completion date is float time.

1.06 MODIFICATION OF CONTRACT TIMES

- A. Contract Times cannot be changed by the submission of a Progress Schedule. Contract Times can only be modified by a Change Order or Contract Amendment.
- B. Submit a Change Proposal for any proposed change in Contract Times, and include justification for the change in accordance with the provisions of the Contract Documents.

1.07 NEAR-TERM LOOK AHEAD SCHEDULES

- A. Provide a near-term look ahead schedule (NTLA Schedule) every 30 days, typically at periodic coordination meetings, using the form provided by the Construction Manager which shows the days of planned activity for the following:
 - 1. Submittals to be provided and day of anticipated return;
 - 2. Equipment and material deliveries;
 - 3. Arrival and departure of key construction equipment; and
 - 4. Activities for the Contractor and each Subcontractor.
- B. Coordinate NTLA Schedule with Project Schedule. Submit a report with each NTLA Schedule identifying deviations from the Project Schedule.
- C. Submit a report of near-term work planned in the previous NTLA Schedule that was delayed or not executed by marking actual activity on the previous near term look ahead schedule. Provide explanation of why planned work was not executed and plan to execute in the future and regain time lost.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 06 GRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish an adequate number of photographs of the Site to clearly depict the completed Project.
 - 1. Provide aerial photographs of the completed Project from an angle and height to include the entire Site.
 - 2. Provide a minimum of four different views.
 - 3. Photograph a panoramic view of the entire Site.
 - 4. Photograph all significant areas of completed construction.
 - 5. Do not take completion photographs until all construction trailers, excess materials, trash, and debris have been removed.
 - 6. Employ a professional photographer approved by the Construction Manager to photograph the Project.
- B. Provide video recordings of the Site.
 - 1. Record the condition of all existing facilities in or abutting the construction area (right-of-way) including streets, curb and gutter, utilities, driveways, fencing, landscaping, etc., prior the beginning of construction. Provide one copy of the dated and labeled recording to the Construction Manager before the start of construction. Provide additional recording as directed by the Construction Manager if the recording provided is not considered suitable for the purpose of recording pre-existing conditions.
 - 2. Provide a video recording of the Site after the Project is complete and all construction trailers, excess materials, trash, and debris have been removed. Provide a 360-degree view of the Project from a consistent height and angle.
 - 3. Format must allow photographic still shots to be extracted from the video recording.
- C. All photographs and video recordings are to become the property of the Owner. Photographs or recordings may not be used for public or private publication or display without the written consent of the Owner.

1.02 DOCUMENTATION

- A. Submit photographic documentation and two DVDs of the video recording in accordance with Section 01 33 00 "Document Management."

1.03 QUALITY ASSURANCE

- A. Provide clear photographs and video recordings taken with proper exposure. View photographs and video recordings in the field and take new photographs or video recordings immediately if photos of an adequate print quality cannot be produced or video

quality is not adequate. Provide photographs with adequate quality and resolution to permit enlargements.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHS

- A. Provide photographs in digital format with a minimum resolution of 1280x960, accomplished without a digital zoom.
- B. Take photographs at locations acceptable to the Construction Manager.
- C. Provide two color prints of each photograph and a digital copy on a DVD of each photograph taken.
- D. Identify each print on back with:
 - 1. Name of the Project.
 - 2. Date, time, location, and orientation of the exposure.
 - 3. Description of the subject of photograph.
- E. Submit photograph in clear plastic sheets designed for photographs. Place only one photograph in each sheet to allow the description on the back to be read without removing the photograph.
- F. Final photographs are to include two 8-inch x 10-inch glossy color prints for each of the 10 photographs selected by the Construction Manager. These photographs are in addition to normal prints.

2.02 VIDEO RECORDING

- A. Provide video recordings in digital format on a DVD that can be played with Windows Media Player in common format in full screen mode without loss of resolution.
- B. Identify Project on video by audio or visual means.
- C. Provide video with file size that does not exceed 1 GB.
- D. Provide video resolution of at least 1080p.
- E. The quality of the video must be sufficient to determine the existing conditions of the construction area. Camera panning must be performed while at rest; do not pan the camera while walking or driving. Camera pans should be performed at intervals sufficient to clearly view the entire construction area.
- F. Label the DVD with construction stationing. Stationing is to be annotated in the video.
- G. The entire construction area recording must be submitted at once. Sections submitted separately will not be accepted.
- H. Site components must be video recorded in an organized sequential order with major components identified.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 35 00 SPECIAL PROCEDURES

PART 1 - GENERAL

1.01 CONSTRUCTION SEQUENCE

- A. Perform the Work as required to complete the entire Project within the Contract Times and in the sequence stipulated below:

Sequence No.	Description	Predecessor Condition
1	Complete relocation of existing sodium chlorite tank, associated piping, and appurtenances.	Proper removal and disposal of sodium chlorite chemical.
2	Complete installation of caustic tank CS-T11, including concrete pad, piping, and appurtenances.	Complete relocation of existing sodium chlorite tank.
3	Complete demolition of existing caustic tanks and associated piping and appurtenances; and installation of caustic tanks CS-T8 and CS-T9, including concrete pad modifications, piping, and appurtenances.	Caustic tanks CS-T10 and CS-T11 complete in place, fully functional, and filled with chemical. Chemical from existing caustic tanks transferred to CS-T10 and CS-T11 such that existing tanks are emptied.
4	Complete demolition of existing ammonia day tank, associated piping, and appurtenances.	Proper removal and disposal of ammonia chemical from ammonia day tank.
5	Complete installation of ammonia day tank, complete in place, fully functional, and filled with chemical.	Complete demolition of existing ammonia day tank.
6	Complete demolition of existing polymer drums, scales, feed pumps, and associated piping and appurtenances.	Proper removal and disposal of polymer from drums.
7	Complete installation of polymer tank, complete in place, fully functional, and filled with chemical.	Complete demolition of existing polymer drums and scales.

- B. Consider the sequences, duration limitations, and governing factors outlined in this Section to prepare the schedule for the Work.
- C. Perform the Work not specifically described in this Section as required to complete the entire Project within the Contract Times.

1.02 CRITICAL OPERATIONS

- A. The Owner has identified critical operations that must not be out of service longer than the designated maximum out of service time and/or must be performed only during the designated times. These have been identified in the table below:

Critical Operation	Max. Time Out of Operation	Hours Operation Can Be Shut Down	Liquidated Damages (\$/hour)
Replacement of Ammonia Day Tank	2 Hours	Coordinate with Owner	\$500/hour
Installation of Polymer Tank and Feed Pumps	Xx Hours	Coordinate with Owner	\$500/hour

- B. Submit a written Plan of Action per Section 01 31 13 "Project Coordination" for approval for critical operations.
- C. Work affecting critical operations is to be performed on a 24-hour a day basis until Owner's normal operations have been restored.
- D. Provide additional manpower and equipment as required to complete the Work affecting critical operations within the allotted time.
- E. Liquidated damages will be assessed if Work on critical operations is not completed within the time indicated.
1. These items are critical to the chemical feed system for the SWTP.
 2. Loss of the use of the ammonia day tank can subject the Owner to loss of revenue, additional operations cost, and fines from regulatory agencies.
 3. Liquidated damages have been established for each critical operation.
- F. Designated Critical Operations are described in more detail as follows:
1. Replacement of Ammonia Day Tank – It will be necessary to shut down the ammonia feed system to perform demolition work, to install the new day tank, and to connect the new tank to the existing feed system. Coordinate with Owner for the time when this shutdown may take place.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 40 00 QUALITY MANAGEMENT

PART 1 - GENERAL

1.01 OVERVIEW

- A. Quality management refers to the overall process of delivering a completed Project to the Owner that complies with the requirements of the Contract Documents. Quality management applies to documentation, products, services and the Work.
- B. The Contractor is responsible for the quality of documentation, products, services and the Work provided.
 - 1. Contractor is to integrate quality control procedures into the execution of the Work that are adequate to produce a Project that meets the requirements of the Contract Documents while minimizing loss of time and increased cost. Contractor is solely responsible for time and cost impacts of correcting Defective Work.
 - 2. Contractor is to provide all testing and inspection required to control the quality of the Work in progress to determine that completed Work will comply with the requirements of the Contract Documents.
 - 3. Contractor is to provide verification or acceptance testing as required by the Contract Documents to demonstrate that the completed Work complies with the requirements of the Contract Documents, except for those test that the OPT has determined are to be conducted independent of the Contractor and identified as OPT testing in the Owner's Quality Management Plan.

1.02 STANDARDS

- A. Provide testing laboratories that comply with the American Council of Independent Laboratories (ACIL) "Recommended Requirements for Independent Laboratory Qualifications."
- B. Perform testing per recognized test procedures as listed in the various Sections of the Specifications, standards of the State Department of Transportation, ASTM International (American Society for Testing and Materials), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.

1.03 DOCUMENTATION

- A. Provide documentation which includes:
 - 1. Contractor's Quality Management Plan that establishes the methods of ensuring compliance with the Contract Documents. Submit this plan as Product Data per Section 01 31 13 "Project Coordination."
 - 2. A statement of qualifications for any proposed testing laboratory that includes a list of the engineers and technical staff that will provide testing services on the Project, descriptions of the qualifications of these individuals, list of tests that can be performed, equipment used with date of last certification, and a list of recent projects for which testing has been performed with references for those projects.

3. Certified Test Reports for products to be incorporated into the Project. Provide reports to indicate that the proposed products comply with the Contract Documents or indicate that the proposed products do not comply with the Contract Documents and why those products do not comply. Submit Certified Test Reports as part of a Shop Drawing submitted per Section 01 33 02 "Shop Drawings."
4. Certified Test Reports for inspections and testing required in this Section and in other Sections of the Specifications. Provide reports to indicate that the Work complies with the Contract Documents or indicate that the Work does not comply with the Contract Documents and why the Work does not comply. Submit these test reports on forms provided by the Construction Manager per Section 01 33 00 "Document Management."
5. Certified Test Reports of Defective Work and Certified Test Reports documenting that successful corrective action has produced Work that complies with the Contract Documents. Construction Manager will maintain a Defective Work register. Progress on correction of Defective Work will be discussed at progress meetings as described in Paragraph 1.05.E. The final Defective Work register will be incorporated into closeout documentation required per Section 01 70 00 "Execution and Closeout Requirements" as a record that all Defective Work has been corrected.

1.04 OWNER'S QUALITY MANAGEMENT ACTIVITIES

- A. OPT may perform its own verification testing independent of the Contractor. Owner's Quality Management Plan describes the OPT's anticipated verification testing program for this Project. The preliminary testing plan is shown in Paragraph 3.04. This plan outlines the anticipated testing in general terms and may not reflect the actual testing performed by the OPT. Actual testing will depend on the Contractor's means, methods, and procedures of construction which will not be known until the Contractor submits the Contractor's Quality Control Plan (CQCP) to the OPT. There is no guarantee that all testing in the preliminary OQMP included in the Bidding/Proposal Documents will be performed by the OPT. Contractor will arrange and pay for all production control testing deemed necessary by the Contractor to produce quality results.
- B. Quality management activities of the OPT are for verifying the results of the Contractor's Work complies with the requirements of the Contract Documents. Performance or non-performance of verification activities by the OPT:
 1. Does not relieve the Contractor of its responsibility to provide Work and furnish products that comply with the requirements of the Contract Documents;
 2. Does not relieve the Contractor of its responsibility to provide adequate quality control measures to produce quality documents, products, services or Work;
 3. Does not relieve the Contractor of its responsibility for damage to or loss of Work or products before OPT's acceptance; and
 4. Does not affect the continuing rights of the Owner after OPT's acceptance of the completed Work.
- C. The Work is subject to OPT's observations or testing at any time. Products which have been tested or inspected and accepted by the OPT at a supply source or staging area may be inspected or tested again by the OPT before, during, or after incorporation into the Work

and rejected if products do not comply with the Contract Documents. Verification testing performed by the OPT will be paid for by the Owner, except for testing related to Defective Work as discussed in Paragraph 3.03.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Review the OQMP and provide a Contractor's Quality Control Plan (CQCP) outlining testing to be provided by the Contractor per Paragraph 1.07.
- B. Implement the CQCP to provide Work that complies with the requirements of the Contract Documents.
 - 1. Provide quality documents meeting the requirements of the Contract Documents.
 - 2. Provide services meeting the requirements of the Contract Documents.
 - 3. Provide the services of a Construction Materials Inspection and Testing (CMIT) provider meeting the requirements of this Section to provide testing required by the Contract Documents to demonstrate that products proposed for the Project in Shop Drawings and Product Data fully comply with the Contract Documents.
 - 4. Inspect and test products to be incorporated into the Project to identify defects before installing them. Do not install Defective products. Conspicuously mark Defective products and remove from the Site. If products are installed before the defect is recognized, remove the Defective products, mark them as Defective and remove them from the Site when the defect is recognized.
 - 5. Integrate production quality control measures into construction activities to produce Work meeting the requirements of the Contract Documents. Inspect self-performed Work and the Work of Subcontractors and Suppliers to identify defects. Correct or replace Defective Work.
 - 6. Provide facilities, equipment, and Samples required for inspections and tests.
 - a. Give the Construction Manager adequate notice before proceeding with Work that would interfere with inspections or testing.
 - b. Notify the Construction Manager and CMIT provider prior to the time that testing is required, providing adequate lead time to allow arrangements for inspections or testing to be performed.
 - c. Do not proceed with Work that would impact the ability to correct defects, or with Work that would require that it be removed to correct defects, until testing is complete, and test results indicate that the corrected Work is acceptable.
 - d. Provide safe access for all CMIT activities, including those to be conducted as part of the Owner's Quality Management Program.
 - e. Cooperate fully with the performance of sampling, inspection, and testing. Provide personnel to assist with sampling or to assist in making inspections and field tests.
 - f. Provide Samples and products in adequate quantities for testing at the Site or at the production source of the product for testing.
 - g. Provide facilities required to store and cure test Samples.

- h. Provide calibrated scales and measuring devices for OPT's use in performing inspections and testing.
 - i. Provide adequate lighting to allow OPT observations.
 - j. Make Contract Documents available to testing agencies when requested.
- C. Perform tests as indicated in Contract Documents. All verification testing is to be observed by the Construction Manager or its designated representative.
- D. Submit test reports to the Construction Manager.
- E. Provide an update on quality control activities performed the previous month and planned for the coming month at monthly progress meetings required by Section 01 31 13 "Project Coordination."
- F. Determine testing or inspections required to implement the CQCP. Include costs for additional testing and inspections required to meet Contractor's quality control obligations in the Contract Price.

1.06 CONTRACTOR'S QUALITY CONTROL MANAGER

- A. Provide a Quality Control Manager for the Project. The Quality Control Manager must have authority to reject Defective Work, redirect the efforts of the Contractor, Subcontractor and Suppliers to correct Defective Work and implement steps to prevent future Defective Work.
- B. The resident superintendent or an approved assistant can serve as Quality Control Manager, provided other duties will allow adequate time to serve in this capacity.

1.07 CONTRACTOR'S QUALITY CONTROL PLAN

- A. Provide a CQCP that describes testing and inspections for Work performed at the Site and at remote locations. Include Work by Subcontractors and Suppliers. The CQCP is to include:
 - 1. A description of the quality control organization, including an organization chart showing lines of authority to control the quality of Work;
 - 2. Documentation describing name, qualifications (in resume format), duties, responsibilities, and level of authority of the Quality Control Manager.;
 - 3. The name, qualifications (in resume format), duties, responsibilities, and authorities of other persons assigned a quality control function;
 - 4. Procedures for scheduling, reviewing, certifying, and managing documentation including documentation provided by Subcontractors and Suppliers;
 - 5. Control, verification, and acceptance testing procedures for each specific test. Include:
 - a. Name of tests to be performed,
 - b. Specification paragraph requiring test,
 - c. Parameters of Work to be tested,
 - d. Test frequency,
 - e. Persons responsible for each test, and

- f. Applicable industry testing standards and laboratory facilities to be used for the test;
- 6. Incorporate the testing specified in the OQMP into the CQCP, specifically identifying the tests or inspections that will be provided by the OQMP;
- 7. Procedures for tracking and documenting quality management efforts per Paragraph 1.03.
- 8. Reporting procedures which incorporate the use of forms provided by the Construction Manager.
- 9. The name of the proposed testing laboratories along with documentation of qualifications per Paragraph 1.03.
- B. Use the Contractor's Quality Control Plan Checklist provided by the Construction Manager to review the CQCP before submitting and include a copy of the completed checklist with the CQCP. Do not begin Work until the CQCP is accepted. Submit an interim plan covering only the portion of Work to be performed if the Contractor plans to begin Work prior to submitting the complete CQCP for the Project. Do not begin Work on other parts of the Project until the complete CQCP is accepted.
- C. Meet with the OPT 7 days after CQCP is submitted and before start of construction to discuss the CQCP.
- D. Notify the Construction Manager of any changes to the CQCP or quality control personnel.

1.08 CONTRACTOR'S USE OF OWNER'S TEST REPORTS

- A. Contractor will receive copies of all test reports documenting Owner's verification tests. Contractor is entitled to rely on the accuracy of these tests results and use these as part of its quality control efforts.
- B. Contractor may submit a Change Proposal if the Owner's testing program deviates significantly from the OQMP. Contractor must demonstrate that actual testing and inspection costs were incurred implementing the CQCP as a result of OPT's decision to not provide testing described in the OQMP.

1.09 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing testing services and interpreting the results of the test performed.
- B. The testing laboratory is not authorized to:
 - 1. Alter the requirements of the Contract Documents;
 - 2. Accept or reject any portion of the Work;
 - 3. Perform any of the duties of the Contractor; or
 - 4. Direct or stop the Work.

1.10 TEST REPORTS

- A. Certified Test Reports are to be prepared for all tests.

1. Tests performed by testing laboratories may be submitted on their standard test report forms if acceptable to the OPT using the process directed by the Construction Manager. These reports must include the following:
 - a. Name of the Owner, Project title and number, and name of the Contractor;
 - b. Name, address, and telephone number of the laboratory;
 - c. Name and signature of the laboratory personnel performing the test;
 - d. Description of the product being sampled or tested;
 - e. Date and time of sampling, inspection, and testing;
 - f. Date the report was issued;
 - g. Description of the test performed;
 - h. Weather conditions and temperature at time of test or sampling;
 - i. Location at the Site or structure where the test was taken;
 - j. Standard or test procedure used in making the test;
 - k. A description of the results of the test;
 - l. Statement of compliance or non-compliance with the Contract Documents; and
 - m. Interpretations of test results, if appropriate.
 2. Submit reports on tests performed by Contractor, Subcontractors, or Suppliers on the as directed by the Construction Manager.
 3. OPT will prepare test reports on tests performed by the OPT.
- B. Submit test reports as directed by the Construction Manager within 24 hours of completing the test. Flag tests reports with results that do not comply with Contract Documents for immediate attention. Notify the Construction Manager using acceptable means other than the test report, immediately of any test that fails to comply with the Contract Documents.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Handle and protect test specimens of products and construction materials at the Site in accordance with recognized test procedures. Provide facilities for storing, curing, and processing test specimens as required by test standards to maintain the integrity of Samples. Transport test specimens in a manner to prevent damage to specimens while in transit.

PART 2 - PRODUCTS

2.01 TESTING APPARATUS

- A. Furnish testing apparatus and related accessories necessary to perform the tests.

2.02 SAMPLE PRODUCTS

- A. Provide Samples of products in adequate quantity for testing.

PART 3 - EXECUTION

3.01 IMPLEMENTING CONTRACTOR'S QUALITY CONTROL PLAN

- A. Perform quality control observations and testing as required in each Section of the Specifications and where indicated on the Drawings.
- B. Include the following phases for each definable work task. A definable work task is one which is separate and distinct from other tasks, has separate control requirements, may be provided by different trades or disciplines, or may be work by the same trade in a different environment.
 - 1. Planning Phase: Perform the following before beginning each definable work task:
 - a. Review the Contract Documents.
 - b. Review documents the Contractor will submit and determine that they are complete in accordance with the Contract Documents.
 - c. Check to ensure that all materials and/or equipment have been tested, submitted, and approved.
 - d. Examine the work area to ensure that all required preliminary Work has been completed and complies with the Contract Documents.
 - e. Examine required materials, equipment, and sample Work to ensure that they are on hand, conform to Contract Documents, Shop Drawings and Product Data, and are properly stored.
 - f. Review requirements for quality control inspection and testing.
 - g. Discuss procedures for controlling quality of the Work. Document construction tolerances and workmanship standards for the work task.
 - h. Check that the portion of the plan for the Work to be performed incorporates document review comments.
 - i. Discuss results of planning phase with the Construction Manager. Conduct a meeting attended by the Construction Manager, Quality Control Manager, superintendent, other quality control personnel as applicable, and the foreman responsible for the work task. Instruct applicable workers as to the acceptable level of workmanship required to meet the requirements of the Contract Documents. Document the results of the planning phase actions by separate meeting minutes prepared by the Quality Control Manager and attached to the quality control report.
 - j. Do not move to the next phase unless results of investigations required for the planning phase indicate that requirements have been met.
 - 2. Work Phase: Complete this phase after the planning phase:
 - a. Notify the Construction Manager at least 1 week in advance of beginning the Work and discuss the review of the planning phase effort to indicate that requirements have been met.

- b. Check the Work to ensure that it is in full compliance with the Contract Documents.
 - c. Verify adequacy of controls to ensure full compliance with Contract Documents. Verify required control inspection and testing is performed.
 - d. Verify that established levels of workmanship meet acceptable workmanship standards. Compare with required Sample panels as appropriate.
 - e. Repeat the work phase for each new crew to work on-site, or any time acceptable specified quality standards are not being met.
- 3. Follow-Up Phase: Perform daily checks to ensure control activities, including control testing, are providing continued compliance with contract requirements:
 - a. Make checks daily and record observations in the quality control documentation.
 - b. Conduct follow-up checks and correct all defects prior to the start of additional work tasks that may be affected by the Defective Work. Do not build upon nor conceal Defective Work.
 - c. Conduct a review of the Work at least 1 month prior to the expiration of the correction period prescribed in the General Conditions with the OPT. Correct defects as noted during the review.
- C. Conduct additional planning and work phases if:
 - 1. The quality of on-going Work is unacceptable;
 - 2. Changes are made in applicable quality control staff, on-site production supervision, or crews;
 - 3. Work on a task is resumed after a substantial period of inactivity; or
 - 4. Other quality problems develop.

3.02 DEFECTIVE WORK

- A. Immediately correct any Defective Work or notify the Construction Manager why the Work is not to be corrected immediately and when corrective action will be completed.
- B. Work performed that is connected or adjacent to Defective Work or Work that would have to be removed to correct Defective Work is also considered to be Defective. Contractor is responsible for all costs associated with replacing any acceptable Work that must be removed, or might be damaged by corrective actions.
- C. Document Defective Work, corrective actions taken to correct defects and that corrected Work complies with the Contract Documents.
- D. Implement countermeasures to prevent future Defective Work.
- E. No payment will be made for Defective Work. Remove Work from the Application for Payment if Work paid for on a previous Application for Payment is found to be Defective.
- F. Owner will withhold payment for Defective Work or Work that has not been tested or inspected in accordance with the CQCP, OQCP, or the Contract Documents.

3.03 VERIFICATION TESTING FOR CORRECTED DEFECTS

- A. Provide verification testing on corrected Work when corrective action is complete to demonstrate that the corrected Work complies with the Contract Documents. Conduct the same tests or inspections used to determine that the original Work was Defective. Different tests or methods may be used if approved by the OPT. Document that Defective Work has been corrected with the Construction Manager.
- B. Pay for verification testing until Work meets quality requirement set forth in the Contract Documents. OPT may perform verification testing as part of its Quality Management Program and impose a Set-off to recover the cost for this testing.

3.04 OWNER'S PRELIMINARY QUALITY CONTROL PLAN

Spec. Section	Test / Frequency	OPT or Contractor
03 30 00	Compressive strength	Contractor
03 30 00	Slump test	Contractor
03 30 00	Air content test	Contractor
03 30 00	Temperature test	Contractor
05 50 00	Welded and bolted connections inspection	Contractor
08 39 19	Field operational test and field chalk test	Contractor
09 96 00.01	Protective coatings testing	Contractor
22 14 29.16	Acceptance test	Contractor
26 01 26	Testing of electrical systems	Contractor
26 05 19	Low voltage power conductors testing	Contractor
26 05 23	Control voltage electrical power cables testing	Contractor
26 05 26	Grounding and bonding testing	Contractor
31 05 16	Classification testing	Contractor
31 23 10	In-place density testing	Contractor
31 23 23.34	Flowable fill backfill testing	Contractor
31 23 33	Compaction testing	OPT
40 90 01	Instrumentation acceptance testing	Contractor
44 42 73	Tank hydrostatic test	Contractor
44 42 73	Pump acceptance test	Contractor

END OF SECTION

01 40 01 IBC SPECIAL INSPECTIONS

PART 1 - GENERAL

1.01 OVERVIEW

- A. The purpose of this Section is to provide the Owner and the Contractor with an understanding of what constitutes special inspections as defined by the International Building Code (IBC), Chapter 17, "Special Inspections and Tests," and the Contractor's requirements per IBC and role in enabling the Owner to perform the inspections, and provide the Owner with a Statement of Special Inspection specific to this Project's Special Inspection requirements.
- B. IBC Special Inspections are not a substitute for other testing required elsewhere in the Contract Documents.
- C. IBC Special Inspections may not be performed by the Contractor, unless the Contractor and Owner are the same entity.

1.02 CONTRACTOR RESPONSIBILITIES

- A. Enable the Owner's Project Team (OPT) to conduct the required IBC Special Inspections as outlined below in "Special Inspection Activities by the Owner."
 - 1. Set up pre-construction meeting and coordinate with OPT, prior to beginning construction, regarding the specific inspection needs and requirements that will be performed as part of these Special Inspections.
 - 2. Provide complete access to the Site and make Contract Documents available at the Site.
 - a. Provide and pay for all means necessary to enable inspection access at each location requiring inspection. This includes ladders, scaffolding, trench boxes/shielding, fall protection, adequate lighting, adequate ventilation, and designated area(s) for storing inspector equipment and test Samples. All required access must be in accordance with OSHA.
 - b. Protect Special Inspection test specimens of products and construction materials at the Site in accordance with recognized test procedures.
 - c. Provide sample materials needed to perform tests.
 - 3. Notify the Construction Manager a minimum of 2 working days in advance of when construction activities requiring testing will be performed or when construction activities will limit and/or prevent inspector(s) from observing construction Work already performed.
 - a. Provide adequate notice before proceeding with Work that would interfere with sampling, testing, or other required verification.
 - b. Notify the Construction Manager prior to the time that sampling or testing is required. Lead time is to be adequate to allow arrangements to be made for testing.
 - c. Do not proceed with any Work until tests indicate that the Work is acceptable.

- d. Notify the Construction Manager when schedules change as soon as a delay is expected.
 - 4. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
- B. Submit the following documentation as Product Data in accordance with Section 01 31 13 "Project Coordination":
 - 1. A schedule that establishes the approximate major and/or critical inspection Milestones. Provide a revised schedule for alterations to the schedule.
 - 2. Contractor's test and inspection log described in Paragraph 3.01 at Substantial Completion.
- C. Special Inspection activities are for the purpose of monitoring the results of the Contractor's Work to see that it is in compliance with the requirements of the Contract Documents.
- D. Special Inspection testing requirements mentioned in this Section do not release the Contractor from providing Contractor required testing specified elsewhere in the Contract Documents.
 - 1. Provide all testing documentation required by the Contract Documents.
 - 2. Pay for testing performed to verify Work performed to cure Defective Work complies with the Contract Documents.
- E. Special Inspection activities or non-performance of Special Inspection activities do not:
 - 1. Relieve the Contractor of its responsibility to perform Work and furnish materials and products and constructed Work conforming to the requirements of the Contract Documents.
 - 2. Relieve the Contractor of its responsibility for providing adequate quality control measures.
 - 3. Relieve the Contractor of its responsibility for damage to or loss of the material, product, or Work before Owner's acceptance.
 - 4. Constitute or imply Owner's acceptance.
 - 5. Affect the continuing rights of the Owner after Owner's acceptance of the completed Work.
- F. All materials and products are subject to Owner's verification testing. Material or products which have been tested or observed by Owner at a supply source or staging area may be re-observed or re-tested by Owner at any time and rejected if they do not comply with the Contract Documents.

1.03 SPECIAL INSPECTION ACTIVITIES BY THE OWNER

- A. OPT will provide registered design professionals for special inspection to meet the requirements of 2015 IBC, Chapter 17, Structural Tests and Special Inspections, adopted by the City of Beaumont. The registered design professional in responsible charge (RDPIRC) will coordinate and provide IBC special inspections during construction on the types of work listed below. Additionally, the OPT will employ one or more approved agencies to

perform inspections and tests during construction on the types of work listed in the Statement of Special Inspection.

- B. The OPT will perform the following:
 - 1. Permit: As required by the Building Official for permit issuance, submit the Statement of Special Inspection shown in Attachment A.
 - 2. Preconstruction: Submit names and qualifications of each individual inspector scheduled to perform these inspections to the Building Official prior to the start of construction. Minimum requirements for inspectors must be as indicated in the Statement of Special Inspection.
 - 3. Inspections: The RDPIRC will forward a copy of all inspection and test reports to the Building Official. Discrepancies must be brought to the immediate attention of the Contractor and Construction Manager.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION REGISTER

- A. Contractor Test and Inspection Register: Include the following:
 - 1. Date Owner was notified of impending construction Work that requires testing and/or that would interfere with subsequent inspections.
 - 2. Name of person notified and the means of notification.
 - 3. Date construction Work in question was completed.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain an up-to-date copy of the Contractor Test and Inspection Register at the Site and with Record Documents. Post changes and revisions as they occur. Provide access to the Contractor Test and Inspection Register for RDPIRC, OPT, and AHJ reference during normal working hours.

3.02 REPAIR AND PROTECTION

- A. General:
 - 1. On completion of inspections and tests, repair damaged construction and restore substrates and finishes.
 - 2. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration in adjoining areas with durable seams that are invisible as possible.
- B. Protect construction exposed by or for special inspection activities.

END OF SECTION

ATTACHMENT A

STRUCTURAL STATEMENT OF SPECIAL INSPECTIONS

This Statement of Special Inspections has been prepared in accordance with 2015 International Building Code, Chapter 17, by the Structural Engineer of Record for the following Project:

Project Name: _____

Location: _____

Owner: _____

Structural Engineer of Record: _____

Design Professional in Responsible Charge: _____

Special Inspector for _____ : _____

Special Inspector for _____ : _____

Special Inspector for _____ : _____

Abbreviations

Inspectors

AWS-CWI: An American Welding Society/American Institute of Steel Construction certified welding inspector.

AWS/AISC-SSI: An American Welding Society certified structural steel inspector.

ACI: An American Concrete Institute certified technician, certified in the applicable construction type.

EIT: An Engineer-In-Training, a graduate engineer who has passed the Fundamentals of Engineering exam, and is under the direct supervision of a PE.

NICET: A National Institute for Certification in Engineering Technologies certified technician, certified in the applicable construction type.

PE: A licensed professional engineer and/or a structural engineer (SE) competent in the area of construction being inspected.

Specifications

ACI 318: American Concrete Institute Building Code Requirements for Structural Concrete.

AISC 360: American Institute of Steel Construction, Specification for Structural Steel Buildings.

ASTM: ASTM International (American Society for Testing and Materials).

AWS: American Welding Society

RCSC: RCSC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

Common Words

C: Continuous observation of specified construction activity.

P: Periodic observation of specified construction activity.

CFSF: Cold formed steel framing.

CD: Contract Documents and/or Shop Drawings (if item is performance specified).

Special Inspector Qualifications

Special Inspectors minimum qualifications are listed below for each area of competency.

Applicable IBC Section	Minimum Inspector Qualifications	Remarks
1704.2.5 & 1705.10 Fabricated Items	N/A	Inspection of a fabrication facility is not required if the fabricator is exempt per IBC. Exemption typically requires a manufacturer be certified by an independent organization (e.g. AISC, IAS, SJI, or NPCA).
1705.2 Steel Construction	AWS-CWI AWS/AISC-SSI, PE, or EIT	All welds must be inspected by an AWS-CWI.
1705.3 Concrete Construction	ACI or NICET, PE, or EIT AWS-CWI	All welds must be inspected by an AWS-CWI.
1705.3 Post-Installed Concrete Anchors	PE	Professional engineer performing inspection must have knowledge of post-installed anchor installation requirements and experience in the design and specifying post-installed anchors.
1705.4 Masonry Construction	ACI or NICET, PE, or EIT AWS-CWI	All welds must be inspected by an AWS-CWI.
1705.5 Wood Construction	Inspector, PE, or EIT	Inspector must have a minimum of 5 years of related experience.
1705.6 Soils	ACI, NICET, PE, or EIT	
1705.7 Driven Deep Foundations	NICET, PE, or EIT	
1705.8 Cast-in-Place Deep Foundations	NICET, PE, or EIT	
1705.9 Helical Pile Foundations	NICET, PE, or EIT	
1705.11 Wind Resistance	PE and AWS- CWI	All welds must be inspected by an AWS-CWI.

Steel Construction

The inspection requirements for this type of construction include structural steel.

Verification and Inspection	Frequency		Remarks
	C	P	
Inspection Tasks Prior to Welding	-	-	Refer to AISC 360, Table N5.4-1 QA requirements.
Inspection Tasks During Welding	-	-	Refer to AISC 360, Table N5.4-2 QA requirements.
Inspection Tasks After Welding	-	-	Refer to AISC 360, Table N5.4-3 QA requirements.
Inspection Tasks Prior to Bolting	-	-	Refer to AISC 360, N5.6 and Table N5.6-1 QA requirements.
Inspection Tasks During Bolting	-	-	Refer to AISC 360, N5.6 and Table N5.6-2QA requirements.
Inspection Tasks After Bolting	-	-	Refer to AISC 360, N5.6 and Table N5.6-3 QA requirements.
Steel Embedded in Concrete	X	-	Prior to placement of concrete verify anchor rods and other embedments supporting structural steel. As a minimum, the diameter, grade, type and length of anchor rod or embedded item, and the extent/depth of embedment into concrete.
Connections and Framing Details	-	X	Verify compliance with CD: including braces and stiffening members, member locations, and application of joint details and applicable notes at each connection.
Fabrication	-	X	If fabricator is audited by an independent agency for each of the items above, then no manufacturer plant verification is required. If fabricator is not exempt, then review fabrication operations and quality control procedures per IBC and AISC, and for each product in accordance with the inspection items noted above.

Concrete Construction

The inspection requirements for this type of construction include cast-in-place concrete.

Verification and Inspection	Frequency		Remarks
	C	P	
Formwork	-	X	Verify formwork for shape, location and dimensions of the concrete member being formed are in conformance with CD.
Reinforcing Steel Material and Type	-	X	Verify size of bars and/or stressing strands, ASTM standard, and grade are in conformance with CD.
Reinforcing Steel Position	-	X	Verify quantity and spacing of bars and/or stressing strands, concrete clear cover on all sides. Verify lap splice type, location, and size. Verify no welding of reinforcing except where specifically noted.

Verification and Inspection	Frequency		Remarks
	C	P	
Welding of Reinforcing Steel	X	-	Verify material being welded is ASTM A706 and per CD. Verify personnel, equipment, materials, and welds per AWS D1.4. Provide 100% visual inspection of all welds.
Cast-In-Place Anchors	-	X	Verify size, type, position, and embedment prior to concrete placement. Verify position after concrete placement.
Cast-In-Place Anchors	X	-	Verify placement and consolidation of concrete around anchors.
Mix Design	-	X	Verify batch plant tickets' mix number matches approved mix design for each mix design and application.
Fresh Concrete Samples	X	-	At the same time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete. Sample per ASTM C31, C143, C231 (or C173), C1064. Refer to Section 03 33 00 "Cast-In-Place Concrete"
Placement Technique	X	-	At the time of concrete or shotcrete placement, verify that proper application techniques are being implemented per the CD and ACI 301.
Curing Technique	-	X	Verify that approved means of curing and extreme weather protection are implemented in accordance with the CD.

Post-Installed Concrete Anchors

The inspection requirements for this type of construction include adhesive and expansion type anchors installed in hardened concrete and masonry construction.

For each construction personnel, anchor type, diameter, and embedment the inspection of initial anchors placed must be continuous based on the requirements below. With the exception of anchors that are upwardly inclined, continuously load in tension, after initial anchor placement inspections have been performed, then inspector may perform quality assurance on a periodic basis.

Any change in personnel or anchor type must require an initial continuous inspection as indicated here.

Verification and Inspection	Frequency		Remarks
	C	P	
Inspection Tasks Prior to Anchor Hole Drilling	-	X	Verify all personnel are qualified to install anchors. Installation of adhesive anchors horizontally or upwardly inclined must be performed by personnel certified by an acceptable program.
	-	X	Verify Contractor has manufacturer's printed installation instructions (MPII) on-site and available for reference by construction personnel.
	-	X	If manufacturer does not have a representative on-site, then special inspector must review MPII with Contractor personnel prior to beginning construction.

Verification and Inspection	Frequency		Remarks
	C	P	
	-	X	Verify edge distance limitations indicated in CD's and existing reinforcing locations compared to proposed anchor hole locations.
	-	X	Verify drill bit diameter matches MPII for anchor diameter indicated in CD's. Special inspector does not need to be present during actual drilling of holes.
Inspection Tasks After Drilling Prior to Anchor Placement	-	X	Verify every hole diameter is in accordance with MPII and verify embedment is in accordance with CD's and hole depth is in accordance with MPII (hole depth may need to exceed embedment depth, refer to MPII).
	-	X	Verify cleaning operations are in accordance with CD's and MPII.
	-	X	Verify anchor type, material, diameter, and length.
	-	X	Where adhesive anchors are specified: verify adhesive type is per CD's, adhesive expiration date, and adhesive dispensing equipment is per MPII.
	-	X	Verify that for horizontal and upwardly inclined adhesive anchors have all MPII required installation items (e.g. piston-plug)
Inspection Tasks During Anchor Placement	-	X	Verify that all anchors are installed in accordance with MPII.

Soils

The inspection requirements for this type of construction include structural fill and compacted fill, and shallow footings, isolated footings, strip footings, and slabs-on-grade.

Verification and Inspection	Frequency		Remarks
	C	P	
Subgrade for Shallow Footings	-	X	Verify that materials below shallow foundations are adequate to achieve the design bearing capacity, excavations are extended to the proper depth, and have reached the proper material.
Backfill Materials	-	X	Perform classification and testing of compacted fill materials. Test per ASTM D422, D1140, and D698 as required to verify fill materials are in accordance with the CD.
Subgrade Preparation	-	X	Verify the use of proper subgrade preparation per the CD, including but not limited to proof rolling and scarifying.
Compaction	X	-	Verify proper fill materials, densities, and lift thicknesses during placement and compaction of fill is in accordance with the CD. Test density of each lift per ASTM D698.

END OF ATTACHMENT A

01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide temporary facilities, including Contractor's field offices, storage sheds, workshops, and other facilities needed to complete the Work.
- B. Provide temporary utilities needed to support the operation of the facilities and construction activities.
- C. Provide and maintain temporary project identification signs for Owner.
- D. Provide temporary informational signs to identify key elements of construction and direct the flow of traffic.
- E. Provide a weatherproof kiosk for display of permits and other notices required by Laws and Regulations.

1.02 QUALITY ASSURANCE

- A. Inspect and test each utility before using facilities. Arrange for all required inspections and tests by regulatory agencies, and obtain required certifications and permits for use of facilities.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Transport, unload, and set up all temporary buildings and utilities.

1.04 JOB CONDITIONS

- A. Locate buildings and sheds at the Site as indicated or as approved by the OPT.
- B. Prepare the Site by removing trees, brush, or debris and performing demolition or grubbing needed to clear a space adequate for the structures.
- C. Provide Contractor's temporary facilities and utilities in time to avoid delays in the performance of the Work.
- D. Provide and maintain temporary facilities and utilities.
- E. Operate temporary facilities in a safe and efficient manner.
 - 1. Restrict loads on utilities to operate within their designed or designated capacities.
 - 2. Provide sanitary conditions. Prevent public nuisance or hazardous conditions from developing or existing at the Site.
 - 3. Prevent freezing of pipes, flooding, or the contamination of water.
 - 4. Maintain site security and protection of the facilities.
- F. Remove temporary facilities and utilities when construction is complete and removal is approved by the Construction Manager.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

- A. Provide wood or metal signs in sound condition, structurally adequate to withstand wind and weather.
- B. Provide 3/4-inch exterior grade A/D face veneer plywood with medium density overlay for sign surface.
- C. Provide galvanized or stainless steel bolts, brackets, fasteners, and other hardware.
- D. Provide exterior quality coatings.

2.02 CONTRACTOR'S FIELD OFFICE

- A. Furnish a field office of adequate size for Contractor's use.
- B. Subcontractors may provide their own field offices only when space is available on the Site and the OPT agrees to its size, condition, and location.

2.03 TEMPORARY STORAGE BUILDINGS

- A. Furnish storage buildings of adequate size to store any materials or equipment delivered to the Site that might be affected by weather.

2.04 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities at the Site for the entire duration of the Project. Maintain these facilities in a clean and sanitary condition at all times, and comply with the requirements of the local health authority. On large sites, provide portable toilets at such locations so that no point at the Site will be more than 600 feet from a toilet.
- B. Use these sanitary facilities. Do not use restrooms within existing or Owner-occupied buildings.

2.05 TEMPORARY HEAT

- A. Provide heating devices needed to protect buildings during construction. Provide fuel needed to operate the heating devices and attend the heating devices at all times they are in operation, including overnight operations.

2.06 TEMPORARY UTILITIES

- A. Provide the temporary utilities for administration, construction, testing, disinfection, and startup of the Work, including electrical power, water, and telephone. Pay all costs associated with furnishing temporary utilities.
 - 1. Provide a source of temporary electrical power of adequate size for construction procedures.
 - a. Use existing power systems where spare capacity is available. Provide temporary power connections that do not adversely affect the existing power supply. Submit connections to the Construction Manager for approval prior to installation.

- b. Provide electrical pole and service connections that comply with Laws and Regulations and the requirements of the power company.
- 2. Provide temporary water. Potable water may be purchased from Owner.
- 3. Provide telephone service to the Site and install telephones inside the Contractor's field office.
- B. Provide power for construction and storage. Provide power to energize space heaters for stored electrical equipment.

2.07 WATER FOR CONSTRUCTION

- A. Provide temporary water. Potable water may be purchased from the Owner by obtaining a water meter from the Owner and transporting water from a water hydrant. Non-potable water may be used for hydraulic testing of non-potable basins or pipelines. Include the cost of water in the Contract Price.

PART 3 - EXECUTION

3.01 LOCATION OF TEMPORARY FACILITIES

- A. Locate temporary facilities in areas approved by the Construction Manager. Construct and install signs at locations approved by the Construction Manager. Install informational signs so they are clearly visible.

3.02 PROJECT IDENTIFICATION SIGNS

- A. Arrange for a professional sign painter to paint and erect a sign for the Site in accordance with the sign information provided in the Contract Documents or provided by Owner. Sign will include identification of the OPT and Contractor (including appropriate logos, as required) and other Project information as determined by the Construction Manager. Paint sign on a 4-foot by 8-foot by 3/4-inch exterior grade plywood board. Frame plywood with 2 x 4 wood frame and mount on not less than two 4 x 4 posts. House plywood board in a channel routed 1/2 inch deep in the 2 x 4 frame. Shoulder, glue, and screw corners.

3.03 TEMPORARY LIGHTING

- A. Provide temporary lighting inside buildings once buildings are weatherproof.
- B. Provide exterior security lighting.
- C. Provide lighting that is adequate to perform Work within any space. Temporary lights may be removed once the permanent lighting is in service.
- D. Provide portable flood lights at any time that Work will be performed outside the structure at night. Provide adequate lighting at any location Work is being performed.

3.04 DRINKING WATER

- A. Provide all field offices with potable water. Provide a dispenser and cooling apparatus if bottled drinking water is provided.
- B. Pay for water services and maintain daily.

3.05 CONSTRUCTION FENCE

- A. Install and maintain a chain-link construction fence around the Site and off-site storage yards. Fence must be a minimum 6 feet high. Provide gates with padlocks.

3.06 REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary buildings, sheds, and utilities at the conclusion of the Project and restore the Site to original condition or finished condition in accordance with the Drawings.
- B. Remove informational signs upon completion of construction.
- C. Remove project identification signs, framing, supports, and foundations upon completion of the Project.

3.07 MAINTENANCE AND JANITORIAL SERVICE

- A. Maintain signs and supports in a neat, clean condition. Repair damage to structures, framings, or signs.
- B. Repair any damage to Work caused by placement or removal of temporary signage.

END OF SECTION

01 57 00 TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide labor, materials, equipment, and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- B. Construct temporary impounding works, channels, diversions, furnishing, and operation of pumps, installing piping and fittings, and other construction for control of conditions at the Site. Remove temporary controls at the end of the Project.

1.02 DOCUMENTATION

- A. Provide Shop Drawings in accordance with Section 01 33 02 "Shop Drawings."
- B. Provide copies of notices, records, and reports required by the Contract Documents or Laws and Regulations as Product Data in accordance with Section 01 31 13 "Project Coordination."

1.03 QUALITY ASSURANCE

- A. Construct and maintain temporary controls with adequate workmanship using durable materials to provide effective environmental management systems meeting the requirements of the Contract Documents and Laws and Regulations. Use materials that require minimal maintenance to prevent disruption of construction activities while providing adequate protection of the environment.
- B. Periodically inspect systems to determine that they are meeting the requirements of the Contract Documents.

1.04 POLLUTION CONTROL

- A. Prevent the contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into the atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
 - 1. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
 - 2. Excavate contaminated soil and dispose at an off-site location if contamination of the soil does occur. Fill resulting excavations with suitable backfill and compact to the density of the surrounding undisturbed soil.
 - 3. Provide documentation to the Owner which states the nature and strength of the contaminant, method of disposal, and the location of the disposal site.

4. Comply with Laws and Regulations regarding the disposal of pollutants.
- C. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or contaminated soil is considered contaminated. Do not allow contaminated water to enter streams or water courses, leave the Site in a non-contained form, or enter non-contaminated areas of the Site.
 1. Construct temporary holding ponds or take other precautions and measures as required to contain the contaminated water and pump to a designated storage area.
 2. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

1.05 EARTH CONTROL

- A. Remove excess soil, spoil materials, and other earth not required for backfill. Control stockpiled materials to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off the Site. Provide written approval from the property owner for soils deposited on private property as Product Data per Section 01 31 13 "Project Coordination." Obtain approval of the OPT if this disposal impacts the use of Site or other easements.

1.06 AIR POLLUTION CONTROL

- A. Air Pollution Watch Days:
 1. Air Pollution Watch Days (APWD) may occur in the following times:
 - a. Typical Ozone Season: May 1 through October 31.
 - b. Critical Emission Time: 6:00 a.m. to 10:00 a.m.
 2. Watch Days:
 - a. State or local environmental regulatory agencies, in coordination with the National Weather Service, may designate the following day as an APWD by 3:00 p.m. on the prior afternoon.
 - b. Begin work after 10:00 a.m. on designated APWD if work requires the use of heavy construction equipment for run times in excess of 1 hour prior to 10:00 a.m. Heavy construction equipment may be used prior to 10:00 a.m. if equipment is certified by EPA as "Low Emitting" or equipment burns Ultra Low Sulfur Diesel (ULSD), diesel emulsions, or alternative fuels such as CNG.
- B. Obtain air permit for construction activities per requirements of Laws and Regulations.

1.07 TEMPORARY STORMWATER POLLUTION CONTROL

- A. Provide temporary stormwater pollution control per Section 01 57 23 "Temporary Stormwater Pollution Control."

1.08 MANAGEMENT OF WATER

- A. Manage water resulting from rains or ground water at the Site. Maintain trenches and excavations free of water at all times.
- B. Lower the water table in the construction area by acceptable means if necessary to maintain a dry and workable condition at all times. Provide drains, sumps, casings, well points, and other water control devices as necessary to remove excess water.
- C. Provide continuous operation of water management actions. Maintain standby equipment to provide proper and continuous operation for water management.
- D. Ensure that water drainage does not damage adjacent property. Divert water into the same natural watercourse in which its headwaters are located, or other natural stream or waterway as approved by the Owner. Assume responsibility for the discharge of water from the Site.
- E. Remove the temporary construction and restore the Site in a manner acceptable to the Construction Manager and to match surrounding material at the conclusion of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials that comply with Laws and Regulations.

PART 3 - EXECUTION

3.01 CONSTRUCTING, MAINTAINING, AND REMOVING TEMPORARY CONTROLS

- A. Construct temporary controls in accordance with Laws and Regulations.
- B. Maintain controls in accordance with regulatory requirements where applicable or in accordance with the requirements of the Contract Documents.
- C. Remove temporary control when no longer required, but before the Project is complete. Correct any damage or pollution that occurs as the result of removing controls while they are still required.

END OF SECTION

01 57 23 TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, equipment, and incidentals necessary to provide stormwater pollution prevention for the duration of the construction period including furnishing, installing, and maintaining erosion and sediment control structures and procedures and properly removing the features when no longer required.
- B. Develop, implement, and maintain a stormwater pollution prevention plan (SWPPP) in compliance with local, state, and federal Laws and Regulations. Provide preventive measures to keep sediment and other pollutants from the construction activity from entering any stormwater system, including open channels.
- C. Comply with the Texas Commission on Environmental Quality General Permit, TXR150000, (General Permit) for storm water discharges from construction activities under the Texas Pollutant Discharge Elimination System (TPDES) program.
- D. File all required legal notices and obtain required permits prior to beginning any construction activity.
- E. This Section provides guidelines and Best Management Practices information for the Contractor to use in adhering to all local, state, and federal environmental Laws and Regulations with respect to stormwater pollution prevention during construction activities.

1.02 DOCUMENTATION

- A. Documentation must be provided in accordance with Section 01 33 00 "Document Management."
- B. Submit copies of required notices and reports to the Construction Manager as Product Data in accordance with Section 01 33 03 "Product Data." Retain copies of these documents at the Site for review and inspection by the OPT or regulatory agencies at all times.
- C. Submit copies of required notices to local, state, and federal authorities and any other entity as required by the General Permit and applicable Laws and Regulations.
- D. Post a copy of required notices at the Site in a location where it is readily available for viewing by the general public and local, state, and federal authorities prior to starting construction activities and maintain the posting until completion of the construction activities.
- E. Maintain copies of a schedule of major construction activities, inspection reports, and revision documentation with the SWPPP required under the General Permit.
- F. Provide schedules in accordance with Paragraph 3.05.

1.03 QUALITY ASSURANCE

- A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Drawings are not intended to be prescriptive but rather to convey

the intent to provide complete slope protection, erosion control, and stormwater pollution prevention for both the Owner's property and adjacent properties.

- B. Perform Work to comply with "Best Practices" as established by the local agency of jurisdiction.
- C. Contractor must develop and implement a SWPPP in accordance with the General Permit prior to the beginning of construction activity.
- D. Contractor assumes solely responsible for implementing, updating, and modifying the General Permit per Laws and Regulations for the SWPPP and Best Management Practices.
- E. Stormwater pollution prevention measures must be established prior to the beginning of construction and maintained during the entire length of construction until final stabilization has been achieved for the area protected.
- F. All land-disturbing activities must be planned and conducted to minimize the area to be exposed at any one time as well as time of exposure, off-site erosion, sedimentation, and adverse water quality impacts.
- G. Surface water runoff originating upgrade of an exposed area must be managed to minimize erosion and sediment loss during the period of exposure.
- H. Install measures to control both the velocity and rate of release so as to minimize erosion and sedimentation of the receiving water body (i.e., ditch, channel, stream) in accordance with regulatory requirements and as directed by the OPT.
- I. Periodically clean out and dispose of all sediment and other pollutants as necessary to maintain adequate treatment capacity of each pollution control feature. Clean out and properly dispose of all sediment and other stormwater pollutants at the time of completion of the Work.

1.04 JOB CONDITIONS, CODES AND ORDINANCES

- A. Comply with the local codes and ordinances. If local codes and ordinances require more stringent or additional stormwater pollution prevention measures during construction beyond those required by state and federal Laws and Regulations, the Contractor must provide such measures at no additional cost.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials used for stormwater pollution prevention must meet the minimum design and specification requirements identified below for commonly used sediment loss prevention. The Contractor must use appropriate control devices to protect against stormwater pollution from construction site activities.
- B. Silt fences for perimeter controls located downstream of disturbed areas are subject to the following design criteria:
 - 1. If 50 percent or less soil by weight passes the U.S. Standard sieve No. 200, select the apparent opening size (A.O.S.) to retain 85 percent of the soil.

2. If 85 percent or more of soil by weight passes the U.S. Standard sieve No. 200, silt fences must not be used unless the soil mass is evaluated and deemed suitable by a soil scientist or geotechnical engineer concerning the erodibility of the soil mass, dispersive characteristics, and the potential grain-size characteristics of the material that is likely to be eroded.
3. Silt fence fabric must meet the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 90 pounds.
 - b. Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280 psi.
 - d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 70 (max) to No. 100 (min).
 - e. Ultraviolet Resistance, ASTM D4355. Minimum 70 percent.
4. Filter stone for an overflow structure must be 1-1/2-inch washed stone containing no fine material. Angular shaped stone is preferable to rounded shaped stone.
5. Fence posts must be galvanized steel or equivalent and may be T-section or L-section, 1.3 pounds per linear foot minimum, and 4 feet in length minimum. Wood posts may be used depending on anticipated length of service and provided they are 4 feet in length minimum and have a nominal cross-section of 2 inches by 4 inches for pine or 2 inches by 2 inches for hardwoods.
6. Silt fence must be supported by galvanized steel wire fence fabric as follows:
 - a. 4-inch by 4-inch mesh size, W1.4/1.4, minimum 14-gauge wire fence fabric;
 - b. Hog wire, 12-gauge wire, small openings installed at bottom of silt fence;
 - c. Standard 2-inch by 2-inch chain link fence fabric; or
 - d. Other welded or woven steel fabrics consisting of equal or smaller spacing as that listed herein and appropriate gauge wire to provide support.
- C. Inlet protection used in new developments that include new inlets or roads with new curb inlets or during repairs to existing roadways are subject to the following design criteria:
 1. Filter fabric protection must be designed and maintained in a manner similar to a silt fence.
 2. Where applicable, filter fabric, posts, and wire backing must meet the material requirements specified in Paragraph 2.01.B.
 3. Filter gravel must be 3/4-inch washed stone containing no fines. Angular shaped stone is preferable to rounded shapes.
 4. Concrete blocks must be standard 8-inch by 8-inch by 16-inch concrete masonry units.

5. When organic filter tubes are used, the designer must specify the type of material to be used (or excluded) on a particular site:
 - a. Straw filter material must be Certified Weed Free Forage. The straw must be in good condition, air-dried, and not rotten or moldy.
 - b. Wood chips must be 100 percent untreated chips and free of inorganic debris, such as plastic, glass, metal, etc. Wood chip size must not be smaller than 1 inch and must not exceed 3 inches in diameter. Shavings must not be more than 5 percent of the total mass.
6. Bags used to secure inlet protection devices on pavement must be filled with aggregate, filter stone, or crushed rock that is less likely than sand to be washed into an inlet if the bag is broken. Filled bags must be 24 to 30 inches long, 16 to 18 inches wide, and 6 to 8 inches thick. Bags must be polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard and meet the following criteria:
 - a. Greater than 300 psi Mullen Burst Strength using ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
 - b. Greater than 70 percent UV Stability using ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus.
- D. Stone outlet sediment traps (bermed or excavated) used in situations where flows are concentrated in a drainage swale or channel are subject to the following design criteria:
 1. The embankment must be placed on geotextile fabric meeting the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Text Method for Grab Breaking Load and Elongation of Geotextiles, 250 pounds.
 - b. Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 135 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 420 psi.
 - d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 20 (max).
 2. Fill placed to constrict the swale for construction of the excavated stone outlet sediment trap and fill placed for the berm in the bermed stone outlet sediment trap must consist of clay material, minimum Plasticity Index of 30, using ASTM D4318 Standard Test for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 3. The embankment must be comprised of well graded stone riprap with a size range of 6 to 12 inches in diameter.

- E. Sediment basins used as treatment devices for sites with disturbed areas of 10 acres and larger that are part of a common drainage area are subject to the following design criteria:
 - 1. The embankment must be constructed with clay soil, minimum Plasticity Index of 30 using ASTM D4318 Standard Test for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 2. Texas Administrative Code Title 30, Chapter 299 (30 TAC 299), Dams and Reservoirs, contains specific requirements for dams that:
 - a. Have a height greater than or equal to 25 feet and a maximum storage capacity greater than or equal to 15 acre-feet;
 - b. Have a height greater than 6 feet and a maximum storage capacity greater than or equal to 50 acre feet;
 - c. Are a high- or significant-hazard dam as defined in Chapter 299, regardless of height or maximum storage capacity; or
 - d. Are used as a pumped storage or terminal storage facility.
- F. Check dams used for long drainage swales or ditches to reduce erosive velocities are subject to the following design criteria:
 - 1. Use geotextile filter fabric under check dams exceeding 12 inches in height. The fabric must meet the material specified for the Stone Outlet Sediment Trap discussed above.
 - 2. Loose, unconfined soil, wood chips, compost, and other material that can float or be transported by runoff must not be used to construct check dams.
 - 3. Sand bags must not be used for check dams, due to their propensity to break and release sand that is transported by the concentrated flow in the drainage swale or ditch.
 - 4. Rock Check Dams:
 - a. Stone must be well graded with stone size ranging from 3 to 6 inches in diameter for a check dam height of 24 inches or less.
 - b. The stone size range for check dams greater than 24 inches is 4 to 8 inches in diameter.
 - 5. Rock Bag Check Dams Bags:
 - a. Fill material should be pea gravel, filter stone or aggregate that is clean and free of deleterious material.
 - b. Bag material must comply with the requirements of Inlet Protection above.
 - 6. Sack Gabion Check Dams:
 - a. Sack gabions must be wrapped in galvanized steel, woven wire mesh. The wire must be 20 gauge with 1-inch diameter, hexagonal openings.
 - b. Stone must be well graded with a minimum size range from 3 to 6 inches in diameter.

7. Organic Filter Tube Check Dams:
 - a. Filter material used within tubes to construct check dams must be limited to coir, straw, aspen fiber and other organic material with high cellulose content.
 - b. The material should be slow to decay or leach nutrients in standing water and comply with the requirements for Inlet Protection above.
- G. Stabilized construction exits used for sites in which significant truck traffic occurs on a daily basis are subject to the following design criteria:
 1. The construction exit material must be a minimum thickness of 6 inches. The stone or recycled concrete used must be 3 to 5 inches in size with little or no fines.
 2. The geotextile fabric must meet the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 300 pounds.
 - b. Puncture Strength, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 120 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 600 psi.
 - d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 40 (max).
- H. Alternative pollution prevention measures selected by the Contractor must be identified from one or more of the following reference sources, as appropriate for the region of the construction activity:
 1. City of Austin Environmental Criteria Manual.
 2. North Central Texas Council of Governments (NCTCOG) integrated Stormwater Management (iSWM) Design Manual for Construction.
 3. Harris County/Harris County Flood Control District/City of Houston Stormwater Management Handbook for Construction Activities.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prepare a SWPPP in accordance with applicable permit requirements for construction activity. Develop the SWPPP in conformance with the General Permit and any applicable local requirements.
- B. Prepare and implement the SWPPP prior to the beginning of construction activity in accordance with local, state, and federal Laws and Regulations.
- C. OPT may require Contractor to install stormwater pollution prevention devices and/or practices during construction in addition to those required under the approved SWPPP. Contractor must remain solely responsible for complying with all local, state, and federal Laws and Regulations.

3.02 INSTALLATION

- A. Erosion control blankets to hold seed and soil in place until vegetation is established on disturbed areas are subject to the following installation criteria:
 - 1. Prior to the installation of any erosion control matting, all rocks, dirt clods, stumps, roots, trash, and any other obstructions that would prevent the mat from lying in direct contact with the soil must be removed.
 - 2. Anchor trenching must be located along the entire perimeter of the installation area, except for small areas with less than 2 percent slope.
 - 3. Installation and anchoring must conform to the recommendations shown within the manufacturer's published literature for the erosion control blanket.
 - 4. Anchors (staples) must be a minimum of 6 inches in length and 1 inch wide. They must be made of 11-gauge wire, or equivalent, unless the ECB is intended to remain in place with final stabilization and biodegrade.
 - 5. Particular attention must be paid to joints and overlapping material. Overlap along the sides and at the ends of ECBs should be per the manufacturer's recommendations for site conditions and the type of ECB being installed. At a minimum, the end of each roll of ECB must overlap the next roll by 3 feet and the sides of rolls must overlap 4 inches.
 - 6. After installation, check blankets for uniform contact with the soil, security of the lap joints, and flushness of the staples with the ground.
- B. Silt fences for perimeter controls located downstream of disturbed areas are subject to the following installation criteria:
 - 1. Construct fences along a line of constant elevation (along a contour line if possible).
 - 2. Maximum drainage area must be 0.25 acres per 100 linear feet of silt fence.
 - 3. Maximum flow to any 20-foot section of silt fence must be 1 cfs.
 - 4. Maximum distance of flow to silt fence must be 200 feet or less. If the slope exceeds 10 percent, the flow distance must be less than 50 feet.
 - 5. Maximum slope adjacent to the fence must be 2:1.
 - 6. Stone overflow structures or other outlet control devices must be installed at all low points along the fence or spaced at approximately 300 feet if there is no apparent low point.
 - 7. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel to prevent bypass of runoff under the fence. Fabric must overlap at abutting ends a minimum of 3 feet and must be joined such that no leakage or bypass occurs. If soil conditions prevent a minimum toe-in depth of 6 inches or installation of support post to depth of 12 inches, silt fences must not be used.
 - 8. Sufficient room for the operation of sediment removal equipment must be provided between the silt fence and other obstructions in order to properly maintain the fence.
 - 9. The last 10 feet (or more) at the ends of a line of silt fence must be turned upslope to prevent bypass of stormwater. Additional upslope runs of silt fence may be needed

every 200 to 400 linear feet, depending on the traverse slope along the line of silt fence.

- C. Inlet protection for new developments that include new inlets or roads with new curb inlets or during repairs to existing roadways are subject to the following installation criteria:
1. Maintain barricades, signs, and safety features around the Work in accordance with all provisions of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD), when installing inlet protection on publicly traveled streets or in developed areas. Ensure that inlet protection is properly designed, installed, and maintained to avoid flooding of the roadway or adjacent properties and structures.
 2. Maximum depth of flow must be 8 inches or less.
 3. A 2-inch overflow gap or weir is required on all curb inlet protection devices.
 4. Positive drainage is critical in the design of inlet protection. If overflow is not provided for at the inlet, excess flows must be routed through established swales, streets, or other watercourses to minimize damage due to flooding.
 5. Filter Fabric Protection:
 - a. Filter fabric protection is appropriate where the drainage area is less than 1 acre and the basin slope is less than 5 percent.
 - b. Filter fabric, posts, and wire mesh must meet the material requirements specified in Paragraph 2.01.B.
 - c. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel. This entrenchment prevents any bypass of runoff under the fence.
 - d. Stone overflow structures must be installed where flow to the inlet is concentrated and more than 1 cfs according to the criteria in Paragraph 2.01.
 6. Block and Gravel Protection (Curb and Drop Inlets):
 - a. Concrete blocks are to be placed on their sides in a single row around the perimeter of the inlet, with ends abutting.
 - b. Openings in the blocks should face outward, not upward. 1/2-inch by 1/2-inch wire mesh must then be placed over the outside face of the blocks covering the holes.
 - c. Filter stone must then be piled against the wire mesh to the top of the blocks with the base of the stone being a minimum of 18 inches from the blocks.
 - d. Alternatively, where loose stone is a concern (streets, etc.), the filter stone may be placed in appropriately sized geotextile fabric bags.
 7. Excavated Impoundment Protection:
 - a. Excavated impoundment protection is only applicable to drop inlets.
 - b. It should not be applied to Y inlets because it will undermine the concrete pad surrounding the inlet opening. Nor can it be used for inlets on pavement.

- c. With this protection method, it is necessary to install weep holes to allow the impoundment to drain completely.
 - d. The impoundment must be sized such that the volume of excavation is equal to or exceeds the runoff volume from the temporary control design storm (2-year, 24-hour) for the inlet's drainage area.
 - e. The trap must have a minimum depth of 1 foot and a maximum depth of 2 feet as measured from the top of the inlet and must have side slopes of 2:1 or flatter.
8. Organic Filter Tube Protection (Curb and Drop Inlets):
- a. Organic filter tubes may be used on paved or unpaved surfaces. On paved surfaces, tubes must be secured in place by rock bags. On unpaved surfaces, the tubes must be embedded in the ground a minimum of 3 inches and staked at 4-foot spacing.
 - b. Designer must provide calculations and specify the diameter of tube to be used based on the inlet's drainage area and the flow rate of runoff to the inlet.
 - c. The minimum allowable diameter is 12 inches.
 - d. For curb protection, the diameter of the tube must be at least 2 inches less than the height of the inlet opening. The tube should not be allowed to block the entire opening, since it will clog.
 - e. The tube must be placed on 4-inch by 4-inch or 2-inch by 4-inch wire mesh to prevent the tube from sagging into the inlet. The tube should be long enough to extend a minimum of 12 inches past the curb opening on each side of the inlet.
- D. Stabilized construction exits for sites in which significant truck traffic occurs on a daily basis are subject to the following installation criteria:
- 1. Limit site access to one route during construction, if possible; two routes for linear and larger projects.
 - 2. Prevent traffic from avoiding or shortcutting the full length of the construction exit by installing barriers. Barriers may consist of silt fence, construction safety fencing, or similar barriers.
 - 3. Design the access point(s) to be at the upslope side of the construction site. Do not place construction access at the lowest point on the construction site.
 - 4. Stabilized Construction Exits are to be constructed such that drainage across the entrance is directed to a controlled, stabilized outlet on-site with provisions for storage, proper filtration, and removal of wash water.
 - 5. The exit must be sloped away from the paved surface so that stormwater is not allowed to leave the Site onto roadways.
 - 6. Minimum width of exit must be 15 feet.
 - 7. Vehicles must not be permitted to track or drop sediment onto paved roads, streets, or parking lots. When necessary, vehicles must be cleaned to remove sediment prior to exit onto paved areas. When washing is required, it must be done on a constructed wheel wash facility that drains into an approved sediment trap or sediment basin or other sedimentation/filtration device.

8. Minimum dimensions for the exit must be as follows:

Tract Area	Min. Width of Exit	Min. Length of Exit
<1 Acre	15 feet	20 feet
≥ 1 acre but <5 Acres	25 feet	50 feet
≥5 Acres	30 feet	50 feet

- E. Install pollution control devices in a manner consistent with their designed intent.

3.03 MAINTENANCE

- A. Maintain pollution prevention control structures and procedures in full working order at all times during construction. This must include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment and other pollutants which accumulate in pollution control devices as necessary to maintain the intended design efficiency for the pollution prevention measure.
- B. Dispose properly of trash, debris, and other pollutants.
- C. Place sediment material in approved earth spoil areas or return the sediment material to the area from which it eroded.
- D. Maintain pollution prevention structures and procedures until construction is complete for the area protected and until the Site achieves final stabilization. Unless more stringently defined by local, state, or federal requirements, final stabilization is defined as achieving 70 percent of background vegetative cover or placement of permanent cover, such as concrete or asphalt.
- E. Upon completion of construction and achievement of final stabilization, properly remove the temporary pollutant control structures and complete the area as indicated. Pollution control devices made of organic materials designed to degrade naturally in place will not require removal, unless specifically required by the OPT.
- F. Erosion control blankets must be inspected regularly (at least as often as required by the General Permit) for bare spots caused by weather related events. Missing or loosened blankets must be replaced or re-anchored. Also check for excess sediment deposited from runoff. Remove sediment and/or replace blanket as necessary. In addition, determine the source of excess sediment and implement appropriate Best Management Practices to control the erosion.
- G. Silt fences must be inspected regularly (at least as often as required by the General Permit) for buildup of excess sediment, undercutting, sags, and other failures. Sediment should be removed when it reaches approximately one-half the height of the fence. In addition, determine the source of excess sediment and implement appropriate Best Management Practices to control the erosion. If the fabric becomes damaged or clogged, it must be repaired or replaced as necessary.
- H. Inlet protection must be inspected regularly (at least as often as required by the General Permit). Floatable debris and other trash caught by the inlet protection should be removed after each storm event. Sediment should also be removed from curb inlet protection after each storm event because of the limited storage area associated with curb inlets. Sediment collected at inlet protection should be removed before it reaches half the height of the protection device. Sediment should be removed from inlets with excavated impoundment

protection before the volume of the excavation is reduced by 50 percent. In addition, the weep holes should be checked and kept clear of blockage. Concrete blocks, 2-inch by 4-inch boards, stakes, and other materials used to construct inlet protection should be checked for damaged and repaired or replaced if damaged. When filter fabric or organic filter tubes are used, they should be cleaned or replaced when the material becomes clogged. For systems using filter stone, when the filter stone becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Because of the potential for inlet protection to divert runoff or cause localized flooding, remove inlet protection as soon as the drainage area contributing runoff to the inlet is stabilized. Ensure that all inlet protection devices are removed at the end of the construction.

- I. The stone outlet sediment trap should be inspected regularly (at least as often as required by the General Permit) to check for clogging of the void spaces between stones. If the filter stone appears to be clogged, such that the basin will not completely drain, then the filter stone will require maintenance. If the filter stone is not completely clogged it may be raked with a garden rake to allow the water to release from the basin. If filter stone is completely clogged with mud and sediment, then the filter stone will have to be removed and replaced. Failure to keep the filter stone material properly maintained will lead to clogging of the stone riprap embankment. When this occurs, the entire stone rip-rap structure will need to be replaced. If the aggregate appears to be silted in such that efficiency is diminished, the stone should be replaced. Trash and debris should be removed from the trap after each storm event to prevent it from plugging the rock. Deposited sediment must be removed before the storage capacity is decreased by one-third, or sediment has reached a depth of 1 foot, whichever is less. The removed sediment must be stockpiled or redistributed in areas that are protected with erosion and sediment controls.
- J. Sediment basins should be inspected regularly (at least as often as required by the General Permit) to check for damage and to ensure that obstructions are not diminishing the effectiveness of the structure. Sediment must be removed and the basin must be re-graded to its original dimensions when the sediment storage capacity of the impoundment has been reduced by 20 percent. The removed sediment may be stockpiled or redistributed on-site in areas that are protected by erosion and sediment controls. Inspect temporary stabilization of the embankment and graded basin and the velocity dissipaters at the outlet and spillway for signs of erosion. Repair any eroded areas that are found. Install additional erosion controls if erosion is frequently evident.
- K. Check dams should be inspected regularly (at least as often as required by the General Permit). Silt must be removed when it reaches approximately one-third the height of the dam or 12 inches, whichever is less. Inspectors should monitor the edges of the dam where it meets the sides of the drainage ditch, swale, or channel for evidence of erosion due to bypass or high flows. Eroded areas must be repaired. If erosion continues to be a problem, modifications to the check dam or additional controls are needed. Care must be used when taking out rock check dams in order to remove as much rock as possible. Loose rock can create an extreme hazard during mowing operations once the area has been stabilized.
- L. Stabilized construction exits should be inspected regularly (at least as often as required by the General Permit). The stabilized construction exit must be maintained in a condition that prevents tracking or flow of sediment onto paved surfaces. Periodic re-grading and top dressing with additional stone must be done to keep the efficiency of the exit from diminishing. The rock must be re-graded when ruts appear. Additional rock must be added

when soil is showing through the rock surface. Additional controls are needed if inspections reveal a properly installed and maintained exit, but tracking of soil outside the construction area is still evident. Additional controls may be daily sweeping of all soil spilled, dropped, or tracked onto public rights-of-way or the installation of a wheel cleaning system.

3.04 FIELD QUALITY CONTROL

- A. In the event of conflict between the specified requirements and stormwater pollution control laws, rules, or regulations or other local, state, or federal agencies, the more restrictive laws, rules, or regulations will apply.

3.05 SCHEDULES

- A. Prior to start of construction, submit schedules to the OPT for accomplishment of temporary and permanent erosion control work in connection with required clearing and grubbing, grading, construction, and paving. Include a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials in the submittal.

END OF SECTION

01 60 00 PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide products for this Project that comply with the requirements of this Section. Specific requirements of the detailed equipment specifications govern in the case of a conflict with the requirements of this Section.
- B. Comply with applicable specifications and standards.

1.02 DOCUMENTATION

- A. Provide documents in accordance with the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. Provide products designed for structural stability and operational capability.
 - 2. Provide members designed to withstand all loads imposed by installation, erection, and operation of the product without deformation, failure, or adversely affecting the operational requirements of the product. Size and strength of materials for structural members are specified as minimums only.
 - 3. Design mechanical and electrical components for all loads, currents, stresses, and wear imposed by startup and normal operations of the equipment without deformation, failure, or adversely affecting the operation of the unit. Mechanical and electrical components specified for equipment are specified as the minimum acceptable for the equipment.
- B. Coordination:
 - 1. Provide coordination of the entire Project, including verification that structures, piping, and equipment components to be furnished and installed for this Project are compatible.
 - 2. Determine that the equipment furnished for this Project is compatible with the requirements of the Contract Documents and with the equipment and materials furnished by others.
 - 3. Provide electrical components for equipment that comply with all provisions of the Contract Documents.
 - 4. Apply protective coatings and paints to equipment in the shop that are fully compatible with the final coatings to be field applied in accordance with the Contract Documents.
- C. Adapting Substitute Products:
 - 1. The Drawings and Specifications are prepared for the specified products. Make modifications to incorporate the products into the Project if a substitution is requested

for a product is and approved in accordance with Section 01 26 00 "Change Management."

2. Do not provide a product with a physical size that exceeds the available space. Consideration may be given to the acceptance of these products or equipment if the Contractor assumes all costs necessary to incorporate the item and the OPT approves such revisions.
3. Coordinate electrical requirements for the products to be installed in the Project, including revisions in electrical equipment components wiring and other elements necessary to incorporate the component.

1.04 STANDARDS

- A. The applicable industry standards referenced in the Specifications apply as if written here in their entirety.
- B. Provide equipment manufactured using structural and miscellaneous fabricated steel conforming to the standards of the American Institute of Steel Construction, except where indicated otherwise.

1.05 WARRANTIES AND GUARANTEES

- A. Normal warranty provisions are as stated in the General Conditions.
- B. Correct Defective Work under the provisions of the General Conditions.
- C. Provide warranties and guarantees for periods as defined in the Contract Documents. Individual Sections of the Specifications may have more stringent warranty requirements than stated in the General Conditions. The most stringent warranty will apply in the event of conflicts within the Contract Documents.
- D. The Contract Documents may require special warranties that guarantee performance at a specified capacity, power consumption, efficiency, or other operating parameter. Correct defects that prevent products from meeting the specified performance parameters. The requirements of the special warranty that guarantee performance will be satisfied when the specified performance parameters have been met for a period of 1 calendar year of operation, unless Owner elects to accept Defective Work under the provisions of the General Conditions.
- E. The Contract Documents may require special warranties for periods extending beyond the one-year correction period specified in the General Conditions. The full warranty provisions and requirements for correction of Defective Work stated in the General Conditions apply throughout the extended warranty period.
- F. Provide a warranty bond to provide the same protection as the Contractor's performance bond for extended special warranties. The warranty bond will become effective on the day the performance bond expires which is 1 year after the date of final payment per the General Conditions. The warranty bond will remain in effect until the extended warranty period has expired.
- G. In the event that products are repaired, modified, or replaced under the warranty bond, then the warranty period will continue on the date of completion of these repairs for a period of 6 months or until the end of the original warranty period, whichever is later. In no

event will the warranty period extend more than 6 months beyond the end of the original warranty period.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide products according to normally accepted engineering and shop practices, except where a higher standard of quality is required by the Contract Documents.
- B. Manufacture like parts of duplicate units to standard sizes and gages that are interchangeable.
- C. Two or more items of the same kind are to be identical and made by the same Supplier.
- D. Provide products suitable for the intended service.
- E. Adhere to the equipment capacities, sizes, and dimensions indicated in the Contract Documents.
- F. Do not use products for any purpose other than that for which they were designed.
- G. Provide new products. Do not provide equipment that has been in service at any time prior to delivery except for testing in accordance with the Contract Documents.
- H. Provide materials suitable for service conditions.
- I. Provide iron castings that are tough, close grained gray iron free from blowholes, flaws, or excessive shrinkage and that conform to ASTM A48.
- J. Design structural members for shock or vibratory loads.
- K. Provide steel that is at least 1/4 inch thick for all elements that will be submerged or subject to splashing all or part of the time during normal operation of the equipment. Chamfer or grind all edges to eliminate sharp exposed edges.

2.02 ELECTRIC MOTORS

- A. Provide equipment with motors that comply with the following requirements unless the detailed equipment specifications have different requirements:
 - 1. Provide motors designed in compliance with NEMA, ANSI, IEEE, and AFBMA standards and the NEC for the specific duty imposed by the driven equipment that are appropriate for the application per these same standards.
 - 2. Provide motors designed for frequent starting duty equivalent to the duty service required by the driven equipment where frequent starting occurs.
 - 3. Provide motors rated for continuous duty at 40 deg. C ambient unless recognized and defined by the standards and codes for intermittent duty as a standard industry practice. Provide motors for which motor temperature rise above 40 deg. C ambient does not exceed the NEMA limit when operating continuously at nameplate horsepower.
 - 4. Provide motors designed to start with an appropriate starter or variable speed drive.

5. Provide motors designed for motor bearing life based upon the actual operating load conditions imposed by the driven equipment.
6. Provide motors sized for the altitude of the location where the equipment is to be installed.
7. Provide motors that meet the following service factor requirements:
 - a. Maximum load of 87 percent of the nameplate horsepower for motors with a 1.0 service factor; and
 - b. Maximum load of 100 percent of the nameplate horsepower for motors with a 1.15 service factor.
8. Provide motors that comply with the latest applicable provisions of NEMA MG1 and are manufactured using the following process when the detailed specifications call for encapsulated motor windings:
 - a. Seal the stator assembly by vacuum pressure impregnation (VPI) with epoxy resin after stator assembly;
 - b. Provide two VPI treatments for stator, with each treatment consisting of a dip followed by an oven bake; and
 - c. Provide a final (third) coating of a durable epoxy varnish suitable for protection against dust, moisture, and chemical degradation after the final cure for the stator assembly.
9. Provide motors with a clamp type grounding terminals inside the motor conduit box.
10. Provide oversized conduit boxes for motors with external conduit boxes.
11. Provide motors with maximum starting current that meets NEMA MG1, Class H.
12. Provide motors with efficiencies that comply with NEMA MG1 for high efficiency motors.
13. Provide motors with minimum insulation Type F.
14. Provide motors that are random wound with copper coils.
15. Provide motors rated for the appropriate classification when motors are installed in a hazardous location.
- B. Provide the manufacturer's standard motor on integrally constructed motor driven equipment such as appliances, hand tools, etc. if redesign of the complete unit would be required to provide a motor with the specified features.
- C. Provide motors within the horsepower ranges indicated below that are rated and constructed as follows unless otherwise required by the detailed equipment specifications.
 1. Below 1/2 hp:
 - a. 115 volts, 60 Hertz, single phase;
 - b. Dripproof in clean and dry locations; TEPF in all other locations;
 - c. Permanently lubricated sealed bearings; and

- d. Built in manual reset thermal protector or furnished with integrally mounted stainless steel enclosed manual motor overload switch.
- 2. 1/2 to 1 hp:
 - a. 230/460 volts, 60 Hertz, 3 phase;
 - b. Dripproof in clean and dry locations, TEFC in all other locations; and
 - c. Permanently lubricated sealed bearings.
- 3. 1-1/2 hp and above:
 - a. 230/460 volts, 60 Hertz, 3 phase;
 - b. Dripproof in clean and dry locations, TEFC in all other locations;
 - c. Oil or grease lubricated anti friction or oil lubricated sleeve bearings; and
 - d. Vertical motors must have 15-year average life thrust bearings.
- D. Provide space heaters operating on 120-volt single-phase service for motors with horsepower ratings of 15 hp or greater.

2.03 EQUIPMENT APPURTENANCES

- A. Provide a safety guard covering all sides on belt or chain drives, fan blades, couplings, and other moving or rotating parts:
 - 1. Fabricate safety guards from 16 US gauge or heavier galvanized or aluminum clad sheet steel or 1/2-inch mesh galvanized expanded metal;
 - 2. Design guards for easy installation and removal;
 - 3. Provide galvanized supports and accessories for each guard;
 - 4. Provide stainless steel bolts and hardware; and
 - 5. Provide safety guards designed to prevent the entrance of rain and dripping water in outdoor locations.

2.04 ANCHOR BOLTS

- A. Provide suitable anchor bolts for each product.
- B. Provide anchor bolts with templates or setting drawings in time to permit casting the anchor bolts in the concrete when concrete is placed.
- C. Provide two nuts for each bolt.
- D. Provide anchor bolts for products mounted on baseplates that are long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete. Bolts must be long enough to provide full nut engagement and leave three threads exposed. Housekeeping pads are not structural concrete.
- E. Provide stainless steel anchor bolts, nuts, and washers.

2.05 SPECIAL TOOLS AND ACCESSORIES

- A. Furnish tools, instruments, lifting and handling devices, and accessories necessary for proper maintenance and adjustment that are available only from the manufacturer or are not commonly available.

2.06 EQUIPMENT IDENTIFICATION PLAQUES

- A. Provide a plaque for each piece of equipment in accordance with Section 40 05 53 "Identification for Process Piping and Equipment."

2.07 LUBRICATION SYSTEMS FOR EQUIPMENT

- A. Provide equipment lubricated by systems which:
 - 1. Require attention no more frequently than weekly during continuous operation.
 - 2. Do not require attention during startup or shut down.
 - 3. Do not waste lubricants.
- B. Provide lubricants to fill lubricant reservoirs and to replace lubricant consumed during testing, startup, and operation prior to acceptance of equipment by the Owner.

2.08 INSULATION OF PIPING

- A. Insulate all piping on or related to equipment as required to prevent freezing under any condition. Insulate piping per the manufacturer's written instructions or per Section 33 05 01.09 "Polyvinyl Chloride (PVC) Pressure Pipe and Fittings," whichever is more stringent.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install equipment including equipment pre-selected or furnished by the Owner. Assume responsibility for proper installation, startup, and making the necessary adjustments so that the equipment is placed in proper operating condition per Section 01 75 00 "Starting and Adjusting."

3.02 LUBRICATION

- A. Lubricate all products provided or installed for this Project, including products furnished by the Owner, per the manufacturer's written recommendations until the product is accepted by the Owner.

END OF SECTION

01 70 00 EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Comply with requirements of the General Conditions and specified administrative procedures in closing out the Contract.

1.02 DOCUMENTATION

- A. Submit affidavits and releases on forms provided by the Construction Manager through the PMIS.

1.03 SUBSTANTIAL COMPLETION

- A. The following requirements must be met for the Project or a designated portion of the Work to be Substantially Complete per the General Conditions:
 - 1. Work must be fully functional and able to operate in accordance with the Contract Documents without special or extraordinary efforts on the part of the Owner.
- B. Conduct inspections with superintendent, Subcontractors, and Suppliers for the Work or a designated portion of the Work prior to calling for a Substantial Completion inspection by the OPT. Create a list of deficiencies in the Work that must be completed for the Project to qualify for Substantial Completion. Review the list with the Construction Manager or the designated member of the OPT. The Construction Manager or the designated member of the OPT may assist the Contractor with this effort; however, it is the Contractor's responsibility to create and manage this list of deficiencies until corrections are made.
- C. Correct the identified deficiencies prior to calling for a Substantial Completion inspection.
- D. Notify the Construction Manager that the Work or a designated portion of the Work is Substantially Complete per the General Conditions. Include a list of the items remaining to be completed or corrected before the Project will be considered for Final Completion.
- E. OPT will visit the Site to observe the Work within a reasonable time after notification is received to determine the status of the Project.
- F. Construction Manager will notify the Contractor that the Work is either Substantially Complete or that additional Work must be performed before the Project will be considered Substantially Complete.
 - 1. Construction Manager will notify the Contractor of items that must be completed before the Project will be considered Substantially Complete.
 - 2. Correct the noted deficiencies in the Work.
 - 3. Notify the Construction Manager when the items of Work in the Construction Manager's notice have been completed.
 - 4. OPT will revisit the Site and repeat the process.
 - 5. Construction Manager will issue a Certificate of Substantial Completion to the Contractor when the OPT considers the Project to be Substantially Complete. The

certificate will include a tentative list of items to be corrected before Final Payment will be recommended.

6. Review the list and notify the Construction Manager of any objections to items on the list within 10 days after receiving the Certificate of Substantial Completion.

1.04 TRANSFER OF UTILITIES

- A. Transfer utilities to the Owner when the Certificate of Substantial Completion has been issued.
- B. Submit final meter readings for utilities and similar data as of the date the Owner occupied the Work.

1.05 CLOSEOUT REQUIREMENTS

- A. Provide the following before Final Completion:
 1. Record Documents per Section 01 31 13 "Project Coordination";
 2. Keys and keying schedule;
 3. Warranties, bonds, and service agreements;
 4. Equipment Installation Reports;
 5. Shop Drawings, Product Data, operation and maintenance manuals, and other documentation required by the Contract Documents;
 6. Specified spare parts and special tools;
 7. Certificates of occupancy, operating certificates, or other similar releases required to allow the Owner unrestricted use of the Work and access to services and utilities;
 8. Evidence of continuing insurance and bond coverage as required by the Contract Documents; and
 9. Final videos and photographs per Section 01 33 06 "Graphic Documentation."

1.06 WARRANTIES, BONDS, AND SERVICES AGREEMENTS

- A. Provide warranties, bonds, and service agreements required by Section 01 33 00 "Document Management" or by the individual Sections of the Specifications.
- B. The date for the start of warranties, bonds, and service agreements is established per the General Conditions.
- C. Compile warranties, bonds, and service agreements and review these documents for compliance with the Contract Documents.
 1. Each document is to be signed by the respective Supplier or Subcontractor.
 2. Each document is to include:
 - a. The product or Work item description;
 - b. The firm name, with the name of the principal, address, and telephone number;
 - c. Scope of warranty, bond, or services agreement;

- d. Date, duration, and expiration date for each warranty bond and service agreement;
 - e. Procedures to be followed in the event of a failure; and
 - f. Specific instances that might invalidate the warranty or bond.
- D. Submit digital copies of the documents to the Construction Manager for review.
- E. Submit warranties, bonds, and services agreements within 10 days after equipment or components placed in service.

1.07 FINAL COMPLETION

- A. Conduct inspections with Superintendent, Subcontractors, and Suppliers prior to calling for a Final Completion inspection by the OPT. Create a list of deficiencies in the Work that must be completed for the Project to qualify for the Final Completion inspection. Review the list with the Construction Manager or the designated member of the OPT. The Construction Manager or the designated member of the OPT may assist the Contractor with this effort; however, it is the Contractor's responsibility to create and manage this list of deficiencies until corrections are made.
- B. Identify, list, and correct deficiencies prior to calling for a Final Completion inspection. The Project at the call for Final Completion represents the Contractor's interpretation of a project completed in conformance with the Contract Documents and reflects the Contractor's representation of a quality project meeting the Owner's expectations.
- C. Notify the Construction Manager when:
 - 1. Work has been completed and complies with the Contract Documents;
 - 2. Equipment and systems have been tested per the Contract Documents and are fully operational;
 - 3. Final operation and maintenance manuals have been provided to the Owner and all operator training has been completed;
 - 4. Specified spare parts and special tools have been provided;
 - 5. Work is complete and ready for final inspection;
 - 6. Final documentation for all outstanding Modifications and Claims (other than those listed on the Certificate of Final Completion) have been processed and are ready for incorporation into the final Application for Payment; and
 - 7. Closeout requirements in Paragraph 1.05 have been completed.
- D. OPT will visit the Site to determine if the Project is complete and ready for final payment within a reasonable time after the notice is received.
- E. Construction Manager will notify the Contractor that the Project is complete or will notify the Contractor that Work is Defective.
- F. Take immediate steps to correct Defective Work. Notify the Construction Manager when Defective Work has corrected. OPT will visit the Site to determine if the Project is complete and the Work is acceptable. Construction Manager will issue a Certificate of Final

Completion to the Contractor when the Project is complete or will notify the Contractor that Work is Defective.

- G. Submit the request for final payment with closeout documentation described in Paragraph 1.06 if notified that the Project is complete and the Work is acceptable.

1.08 REINSPECTION FEES

- A. Owner may impose a set-off against the Application for Payment in accordance with the General Conditions to compensate the OPT for additional visits to the Project if additional Work is required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 74 23 FINAL CLEANING

PART 1 - GENERAL

1.01 SUMMARY

- A. Perform a thorough cleaning of the Site, buildings, or other structures prior to Owner occupancy of the buildings, and prior to Final Completion. Leave the Project clean and ready for occupancy.

1.02 DOCUMENTATION

- A. Provide data for maintenance per Section 01 33 04 "Operation and Maintenance Data."

1.03 QUALITY CONTROL

- A. Use experienced workmen or professional cleaners for final cleaning.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnish the labor and products needed for cleaning and finishing as recommended by the manufacturer of the surface material being cleaned.
- B. Use cleaning products only on the surfaces recommended by the Supplier.
- C. Use only those cleaning products which will not create hazards to health or property and which will not damage surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. Thoroughly clean the entire Site and make ready for occupancy.
 - 1. Remove construction debris, boxes, and trash from the Site.
 - 2. Remove construction storage sheds and field offices.
 - 3. Restore grade to match surrounding condition and remove excess dirt.
 - 4. Sweep all drives and parking lots clean of dirt and debris. Use water trucks or hose down paved site to like new appearance.
- B. Clean floors and inspect for damage.
 - 1. Remove oil, grease, paint drippings, and other contaminants from floors, then mop repeatedly until thoroughly clean. Replace damaged flooring.
 - 2. Clean resilient flooring with an approved cleaner and provide one coat of liquid floor polish as recommended by the flooring manufacturer. Polish to a buffed appearance with powered floor buffer.
 - 3. Vacuum all carpets with powered floor sweeper to remove dirt and dust. Remove glue or other substances from nap of carpet.

- C. Clean and polish inside and outside glass surfaces. Wash with window cleaner and water, apply a coat of high quality glass polish, and wipe clean. Do not scratch or otherwise mar glass surfaces.
- D. Clean wall surfaces to remove dirt or scuff marks. Remove excess adhesive along top edges of wall base. Remove adhesive from surfaces of vinyl wall coverings.
- E. Align ceiling tile to fit properly in grid and replace cracked or damaged tile. Remove smear marks and other dirt from tile and clean surface of grid system.
- F. Spot paint nicks and other damage. Repaint the wall from inside corner to inside corner if spot-painting does not blend into the existing color and texture of the surrounding surfaces. Touch up damaged surfaces on factory finished equipment using special paint furnished by the manufacturer.
- G. Clean plumbing fixtures, valves, and trim. Clean toilet seats and covers. Remove labels and adhesive from fixtures. Remove floor drains and clean baskets or buckets. Polish strainers and exposed chrome or brass.
- H. Remove dirt, oil, grease, dust, and other contaminants from floors, equipment, and apparatus in mechanical and electrical rooms.
- I. Clean and polish ceramic tile floors and wall surfaces to remove mildew or other stains. Tuck point defective joints.
- J. Inspect exterior painted surfaces. Spot paint any damaged surfaces.
- K. Clean permanent filters and replace disposable filters on heating, ventilating, and air conditioning systems. Clean ducts, blowers, and coils if units were operated without filters during construction.
- L. Clean roof areas of debris; flush roof drainage systems with water until clear.
- M. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.
- N. Clean and polish all electrical equipment and exposed conduits. Remove paint overspray. Provide a blemish free appearance on all exposed equipment and conduits.

END OF SECTION

01 75 00 STARTING AND ADJUSTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide step-by-step procedures for starting provided systems, including equipment, pumps, and processes.
- B. Provide pre-startup inspections by equipment manufacturers.
- C. Place each system in service and operate the system to prove performance and to provide for initial correction of defects in workmanship, calibration, and operation.
- D. Provide for initial maintenance and operation.
- E. Include costs for starting and adjusting provided by manufacturer's representative in the Cost of Work for the equipment package.
- F. Owner will provide chemicals, if any, required for continued operations.

1.02 STANDARDS

- A. Comply with the specified standards associated with the testing or startup of equipment.

1.03 DOCUMENTATION

- A. Provide the following documents in accordance with Section 01 33 00 "Document Management":
 - 1. A Plan of Action for testing, checking, and starting equipment as Product Data per Section 01 31 13 "Project Coordination."
 - 2. Equipment Installation Reports on the form provided by the Construction Manager certifying that the equipment and related appurtenances have been thoroughly examined and approved for startup and operation.
 - 3. Operation and maintenance manuals per Section 01 33 04 "Operation and Maintenance Data." Preliminary operation and maintenance data must be approved before installation, testing, and initial operation of equipment or providing training required by Section 01 79 00 "Training of Operation and Maintenance Personnel."

1.04 SPECIAL JOB CONDITIONS

- A. Do not start or test any equipment until the complete unit has been installed and thoroughly checked.
- B. Provide the services of a qualified representative of the manufacturer to attend the tests and startup procedures as required by this Section.
- C. Do not start or test any equipment until the preliminary operation and maintenance manual per Section 01 33 04 "Operation and Maintenance Data" has been approved.

PART 2 - PRODUCTS

2.01 TESTING INSTRUMENTATION

- A. Provide new instrumentation and testing devices needed to conduct tests for maintenance and operation as recommended in the operation and maintenance manuals. This equipment is to become the property of the Owner and transferred in good working order as a spare part at Substantial Completion. This equipment is to be calibrated and ready for use during the startup procedure and for training provided in accordance with Section 01 79 00 "Training of Operation and Maintenance Personnel."

PART 3 - EXECUTION

3.01 SERVICES OF MANUFACTURER'S REPRESENTATIVES

- A. Provide the services of experienced and technically competent representatives of the manufacturer for inspections, tests, supervision of installation, training, and assistance with placing equipment in operation.
- B. Perform installation, adjustment, and testing of the equipment under the direct supervision of the manufacturer's representative where specified. Certify that the equipment and related appurtenances have been thoroughly examined and approved for startup and operation in the Equipment Installation Reports.
- C. Provide on-site services as necessary for proper and trouble free operation of the equipment.

3.02 INSPECTION AND STARTUP

- A. Inspect equipment prior to placing any equipment or system into operation. Make adjustments as necessary for proper operation. Do not start or test any apparatus until the complete unit has been installed and thoroughly checked.
 - 1. Check for adequate and proper lubrication.
 - 2. Determine that parts or components are free from undue stress from structural members, piping, or anchorage.
 - 3. Adjust equipment for proper balance and operations.
 - 4. Determine that vibrations are within acceptable limits.
 - 5. Determine that equipment operates properly under full load conditions.
 - 6. Determine that the equipment is in true alignment.
 - 7. Ensure that the proper procedure is employed in startup of systems.

3.03 STARTING REQUIREMENTS

- A. Refer to the individual Specification Sections for specific startup procedures or other requirements.

3.04 INITIAL OPERATION

- A. Start, test, and place equipment and systems into operation for 30 days to allow the OPT to observe the operation and overall performance of the equipment and to determine that controls function as intended.
- B. Operate equipment which is used on a limited or part-time basis in the presence of the OPT for a period long enough to demonstrate that controls function as specified.
- C. Perform acceptance test as specified in individual Specification Sections. Demonstrate that equipment and systems meet the specified performance criteria.
- D. Equipment and systems may be considered as substantially complete at the end of this initial operation period if the equipment is placed in continuous beneficial use by the Owner, unless specifically stated otherwise in the individual equipment Specifications.

3.05 INITIAL MAINTENANCE

- A. Maintain equipment in accordance with the operation and maintenance manuals until Project is substantially complete and provisions have been made by the Owner for accepting responsibility for equipment operation in accordance with the General Conditions.
- B. Service equipment in accordance with the operation and maintenance manuals immediately before releasing the equipment to the Owner.

END OF SECTION

02 41 00 DEMOLITION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary for every type of required demolition.
- B. Furnish equipment of every type required to demolish and transport construction debris away from the Site.
- C. Coordinate all demolition work with Section 01 35 00 "Special Procedures" if required.

1.02 STANDARDS

- A. Work shall be performed in accordance with the codes and ordinances of the agency having authority over the Place of Record.
- B. Resilient Floor Covering Institute (RFCI) publication "Recommended Work Practices for the Removal of Resilient Floor Coverings"
- C. Occupational Safety and Health Association (OSHA), 29 CFR Parts 1010 and 1926, "Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite", 40 CFR Part 61 - "National Emission Standard for Hazardous Air Pollutants"

1.03 DELIVERY AND STORAGE

- A. Stockpile construction debris at the Site only as long as necessary to haul to a disposal site. Stack materials neatly and handle in an orderly manner until removed from the Site.

1.04 JOB CONDITIONS

- A. Contractor shall visit the Site and determine the extent of demolition required and the Site conditions that might affect its proposal. Include costs of covering all aspects of the demolition as part of the proposal.
- B. The Drawings shall be carefully reviewed to determine the extent of necessary demolition and to identify elements of the existing construction which are to remain in place. Report any discrepancies to Owner and Engineer before disturbing existing conditions. Property lines and limits of demolition shall be accurately located prior to beginning site demolition. Start of demolition activities shall represent confirmation by Contractor that existing conditions are as presented in the Contract Documents. Demolition outside the limits indicated on the Drawings, or outside the property lines shall not be performed.
 - 1. For electrical demolition, verify field measurements and circuiting arrangements are as shown on the Drawings. Verify that existing wiring and equipment designated to be abandoned or demolished serve only abandoned facilities.
 - 2. For process piping demolition confirm with the Owner that current operations will not be impacted and provide temporary equipment with Owner to keep systems functional during demolition process if required.

- C. Material removed during demolition, and any equipment not otherwise designated to remain the property of the Owner, shall become the property of the Contractor, and shall be promptly removed from the Site.
- D. Equipment and material designated as remaining the property of the Owner shall be removed from the structure and transported to a designated location on the Site and stored for the Owner's use. Store on wood runners raised above the surrounding grade and cover with weather resistant covering that is tied securely in place.
- E. Take necessary precautions in removing Owner designated property to prevent damage during the demolition process. Equipment shall be removed in one piece. Loose components may be removed separately. Controls and electrical equipment may be removed from the equipment and handled separately. Large units, such as motor driven pumps, may be dismantled and motors handled separately. Do not use a cutting torch to separate the Owner's equipment or material. Salvaged piping shall be taken apart at flanges or fittings and removed in sections.
- F. The Owner's designated property shall include:
 - 1. Any item to remain as part of the existing building and removed and reinstalled within the building as part of the renovated structure.
 - 2. Motors, starters, relays, disconnect switches, panelboards and breakers.
 - 3. Light fixtures.
 - 4. Control devices of every description.
 - 5. Valves, piping accessories, and other major piping components.
 - 6. Flush valves and fixture trim from plumbing fixtures.
 - 7. Motorized dampers and operators.
 - 8. Exhaust fans, air handling units, unit heaters and air devices (grilles).
 - 9. Copper wiring pulled from conduits.
 - 10. Piping as follows:
 - a. To be coordinated with the City.
 - 11. Equipment as follows:
 - a. To be coordinated with the City.
 - 12. Other items to be coordinated with the City.

1.05 HAZARDOUS MATERIALS

- A. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.

2.00 PRODUCTS

2.01 MATERIALS

- A. New materials and equipment for patching and extending work shall meet the requirements of the individual Sections in these Contract Documents. For materials not addressed in these documents, materials used shall meet or exceed the dimensions and quality of the existing work.

3.00 EXECUTION

3.01 SITE CLEARING

- A. Perform site clearing to the limits indicated on the Drawings. Scrape the Site, removing brush, trees, weeds and trash. Haul debris away from the Site to an approved site as it accumulates.
- B. Grub out tree and brush roots within the limits of buildings, parking lots, driveways and other structures. Remove rock out-croppings and boulders from any area within the limits of grading or structures. Remove roots and backfill any excavation resulting from tree removal with suitable soil for final grading plan.
- C. Trees not located within the construction limits, or otherwise indicated for removal, shall remain in place. Visit the Site with the Engineer or Owner and identify those trees that are to remain. Mark all other trees with yellow paint to indicate removal. Protect remaining trees during construction. Wrap the tree trunks with 2 x 4 timbers if construction equipment must operate in close proximity to them.
- D. Only designated trees shall be removed. In the event that trees other than those designated are erroneously removed or damaged to the point of distress, install replacement trees of equal size and number to compensate for those destroyed, at no additional cost to the Owner.

3.02 BUILDING DEMOLITION

- A. Prepare for demolition of electrical facilities as follows:
 - 1. Coordinate utility service outages with the appropriate utility company.
 - 2. Meet with Owner and identify any material to be salvaged.
 - 3. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
 - 4. Provide temporary wiring and connections to maintain existing systems in service during demolition.
 - 5. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
 - 6. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Make temporary connections to maintain services in areas adjacent to work area. Minimize outage duration.

7. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and telephone utility company at least 72 hours before partially or completely disabling system. Make temporary connections to maintain service in areas adjacent to work area. Minimize outage duration.
- B. Demolition shall include any item noted on the Drawings or required to make room for new Work as indicated on the Drawings. Demolition drawings included in the Contract Documents are provided for the Contractor's reference, but are not intended to limit the demolition to those items shown or otherwise noted. Contractor is responsible to verify for himself any demolition necessary to perform the Work.
- C. Remove all existing acoustical ceilings and related suspension systems. Also remove light fixtures and other appurtenances installed along the suspended ceilings. Where electrical components are removed, also remove all conduit and wiring back to the panel. Where all loads are removed from a branch circuit, leave breaker and re-use for new Work, or designate as a spare. Remove exposed abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces. Where electrical outlets are removed from an electrical circuit scheduled to remain in use, re-connect wiring and conduit as required to make the remaining circuit electrically continuous. Provide blank cover for abandoned outlets which are not removed.
- D. Remove all partitions indicated on the Drawings or required to complete the new construction. Where partitions are noted to be removed, also remove all electrical devices, conduit and wiring inside the partitions. Where existing partitions have plumbing stacks or domestic water piping inside partitions, also remove all piping and other related components. Remove all plumbing fixtures and related trim, fittings and fixture hangers.
- E. Remove all electrical components scheduled for demolition, including light fixtures, duplex receptacles, switches, and panelboards, complete with related feeders, conduit and wiring. Remove disconnect switches, motor starters, panelboards and related feeders. Cut conduit flush with walls and floors, and patch surfaces. Where electrical components are removed from an electrical circuit scheduled to remain in use, re-connect wiring and conduit as required to make the remaining circuit electrically continuous. Provide blank cover for abandoned outlets which are not removed.
- F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- G. Remove all heating, ventilation and air conditioning equipment and related ductwork, including air devices, hangers, fire dampers and other related items.
- H. Where conduit, piping, or other utilities are presently installed under concrete slabs and the underground portion of the component is to be abandoned in place, remove conduit or piping to a point 2 inches below level of concrete slab surface and cap off. Abandon under floor conduit and piping. Patch concrete as required to match surrounding area.
- I. Remove vinyl composition flooring, wall base and flooring mastic. In the event that Contractor suspects materials may contain asbestos, notify Engineer in accordance with Section 01 35 00 "Special Procedures."
- J. Remove ceramic wall tile and ceramic floor tile scheduled for demolition. Where ceramic floor tile was installed on a setting bed, also remove setting bed down to concrete floor slab.

Resulting recess at setting bed shall be filled with epoxy grout to match level of surrounding floor slab.

3.03 REMOVAL OF CONCRETE SLABS

- A. Remove parts of the existing concrete floor slab as indicated on the Drawings. Saw-cut the existing slab with two parallel lines around the area to be removed to the depth of the reinforcing. Do not cut reinforcing. Break out the remainder of the slab using jackhammers or by manual means. Cut reinforcing at a distance of 24 inches from the cut edge of the slab and bend back out of the way. Perform the remainder of the demolition, removing underground piping, or installing new Work.
- B. After buried Work has been completed, bend the reinforcing bars back into proper place and add new reinforcing of the same size and number as the remaining dowels. Lap the joints a minimum of 18 inches and securely tie in place. Replace concrete as required to repair the slab. Concrete shall be Type A as specified in Section 03 30 00 "Cast-In-Place Concrete."

3.04 REMOVAL OF EXISTING SITE STRUCTURES

- A. Remove concrete or masonry structures located below the ground line where indicated or where such structures will interfere with new construction. Where structures are a part of an active underground utility system, repair piping to prevent blockage in the flow.
- B. Remove abandoned manholes, basins, or similar structures. With the Engineer's approval, and if structures will not interfere with any other proposed construction, they may be abandoned in place. Remove the top part of the structure so that it is a minimum of 2 feet below the new finish grade. Remove part of the floor system of basins, manholes and other such structures to prevent entrapment of water. Fill remaining cavities with approved backfill material.

3.05 REMOVAL OF STRUCTURES

- A. Removal of Steel Structures: Meet with Owner and identify any material to be salvaged. Protect such material from damage using protective demolition methods. Remove steel structural members by unbolting, cutting welds, or cutting rivet heads and punching shanks through holes. Do not use flame-cutting unless approved by the Engineer.
- B. Removal of Timber Structures:
 - 1. Protect existing timber structures designated by Owner as salvageable. Remove using protective measures which prevent damage. Disconnect wood members at joints by removing fasteners. Do not cut into smaller sections, unless approved by the Engineer.
 - 2. Extract timber piles from the ground, except when existing piles are located in an area not interfering with any other construction. When approved by the Engineer, piles may be cut 3 feet below the finished ground line.

3.06 REMOVAL OF PIPE

- A. Meet with Owner and identify any material to be salvaged. Remove pipe designated for salvage by carefully excavating surrounding backfill material. Remove pipe using protective measures which prevent damage. Piping shall be disconnected at joints, allowing removal in

one piece. Salvaged pipe determined unsatisfactory for re-use by the Engineer may be removed in any manner. Suspended or supported pipe shall be disassembled at joints. Remove in sections without cutting. Welded pipe sections may be cut with a torch, but cuts shall be along a welded joint.

3.07 UNDERGROUND PIPING

- A. Contractor shall be responsible for obtaining location of underground utilities at the Site. Arrange for all applicable utility companies to accurately locate underground piping and set color-coded flags along the pipe route. Investigate utility company's records to ascertain depths and sizes of piping and other ancillary features.
- B. In the event that exact location of piping cannot be obtained, dig test holes as necessary to establish location of piping. Contractor shall not use mechanical digging machines within 6 feet of any active buried piping. For a distance of 4 feet on either side of buried piping, all digging shall be by hand excavation. If the piping is not active, or is to be abandoned or removed, any form of excavation may be used. Any existing active piping that is damaged during demolition will be repaired to new condition by the Contractor at no additional cost to the Owner.

3.08 BACKFILLING

- A. Backfill cavities resulting from demolition. Fill cavities occurring within the limits of buildings, structures, or pavements in accordance with the requirements of other Sections of the Specifications. Backfill and compact cavities outside the construction limits to the same density as the surrounding earth. No testing is required for backfill outside the limits of new construction.

3.09 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Lights: Use mild detergent to clean all exterior and interior surfaces. Rinse with clean water and wipe dry. Replace lamps and broken electrical parts impacted by the demolition processes.

END OF SECTION

03 11 00 CONCRETE FORMING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish material and labor to form, tie, brace and support wet concrete, reinforcing steel and embedded items until the concrete has developed sufficient strength to remove forms.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete, the temperature of the concrete, and all other pertinent factors shall be taken into consideration when determining the depth of the equivalent liquid. An additional design live load of 50 pounds per square foot shall be used on horizontal surfaces.
- B. Alignment Control: True alignment of walls and other vertical surfaces having straight lines or rectangular shapes shall be controlled and checked by the following procedures:
 - 1. Forming shall be arranged with provisions for adjusting the horizontal alignment of a form, after the form has been filled with concrete to grade, using wedges, turn buckles, or other adjustment methods. Establish a transit line or other reference so that adjustments can be made to an established line while the concrete in the top of the form is still plastic.
 - 2. Adjusting facilities shall be at intervals which permit adjustments to a straight line. Concrete shall not be placed until adequate adjusting facilities are in place.
- C. Tolerances: Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Record Data: Manufacturers' literature for specified products.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American Concrete Institute (ACI) Specifications:

ACI 117	Specifications for Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete
ACI 318	Building Code Requirements for Structural Concrete
 - 2. American Institute of Steel Construction (AISC) Publication:
 - a. AISC Manual of Steel Construction.

3. American Iron and Steel Institute (AISI) Publication:
 - a. AISI Cold Formed Steel Design Manual.
4. American Plywood Association (APA) Standards:
 - a. APA Design/Construction Guide: Concrete Forming.

1.05 DELIVERY AND STORAGE

- A. Lumber for forms shall be stacked neatly on platforms raised above ground.

1.06 JOB CONDITIONS

- A. The Contractor shall notify the Engineer upon completion of various portions of the work required for placing concrete so that compliance with the plans and specifications may be monitored. The Engineer will authorize the Contractor to proceed with the placement after this has been completed and corrections, if required, have been made.
- B. In hot weather, both sides of the face forms may be required to be treated with oil to prevent warping and to secure tight joints.

2.00 PRODUCTS

2.01 MATERIALS

- A. Lumber: Properly seasoned and of good quality; free from loose or unsound knots, knot holes, twists, shakes, decay, splits, and other imperfections which would affect its strength or impair the finished surface of the concrete.
- B. Fiber Board Form Lining: Hardboard finished smooth on one side; minimum thickness of 3/16 inch thoroughly wet with water at least 12 hours before using.
- C. Plywood Form Lining: Conforming to APA HDO; exterior exposure waterproof adhesive, 3/8 inch thick.
- D. Form Oil: Light, clear oil; shall not discolor or injuriously affect the concrete surface, subsequent coatings, or delay or impair curing operations.

2.02 FABRICATIONS

- A. Lumber: Lumber for facing or sheathing shall be surfaced on at least one side and two edges, and sized to uniform thickness. Lumber of nominal 1-inch thickness or plywood of 3/4-inch thickness shall be permitted for general use on structures, if backed by a sufficient number of studs and wales.
- B. Special Form Lumber:
 1. Molding for chamfer strips or other uses shall be made of redwood, cypress, or pine materials of a grade that will not split when nailed, and which can be maintained to a true line without warping. The form shall be mill cut and dressed on all faces. Fillet forms at sharp corners, both inside and outside and at edges, with triangular chamfer strips at all non-contiguous edges exposed to view. Thoroughly oil chamfer strips before installation on forms.

2. All moldings, panel work, and bevel strips shall be straight and true with neatly mitered joints, and designed so that the finished work shall be true, sharp and clean cut.
- C. Forms:
1. Forms shall be built mortar tight and of material sufficient in strength to prevent bulging between supports.
 2. Reused forms or form lumber shall be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness, and smoothness of surface.
 3. All forms shall be so constructed as to permit removal without damage to the concrete. Exercise special care in framing forms for copings, offsets, railing and ornamental work, so that there will be no damage to the concrete when the forms are removed.
- D. Metal Forms:
1. The specifications for "Forms" regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, re use, oiling, and wetting shall apply equally to metal forms.
 2. The metal used for forms shall be of such thickness that the forms will remain true to shape. Bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete.
 3. Metal forms which do not present a smooth surface or line up properly shall not be used. Exercise special care to keep metal free from rust, grease, or other foreign material that discolors the concrete.
- E. Form Linings:
1. Timber forms for exposed concrete surfaces which are to be given a rubbed finish shall be face-lined with an approved type of form lining material.
 2. If plywood is used for form lining, it shall be made with waterproof adhesive and have a minimum thickness of 3/4 inch. It shall preferably be oiled at the mill and then re-oiled or lacquered on the job before using.
 3. If fiber board is used, apply water to the screen side on the board. Stack the boards screen side to screen side. Use the smooth hard face as the contact surface of the form. Such surfaces may be formed with 3/4-inch thick plywood made with waterproof adhesive if backed with adequate studs and wales. The greatest strength of the outer plies should be at right angles to the studding. In this case, form lining will not be required.
 4. Carefully align edges and faces of adjacent panels and fill the joints between panels with patching plaster or cold water putty to prevent leakage. Lightly sand with No. 0 sandpaper to make the joints smooth.
 5. Forms which are reused shall have all unused form tie holes filled and smoothed as specified above.
- F. Form Ties:
1. Metal form ties shall be used to hold forms in place and to provide easy metal removal. The use of wire for ties shall not be permitted.

2. Leave no metal or other material within 1-1/2 inches of the surface, when removing form tie assemblies which are used inside the forms to hold the forms in correct alignment. The assembly shall provide cone-shaped depressions in the concrete surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching. Such devices, when removed, shall leave a smooth depression in the concrete surface without undue injury to the surface from chipping or spalling.
3. Burning off rods, bolts, or ties shall not be permitted.
4. Metal ties shall be held in place by devices attached to wales. Each device shall be capable of developing the strength of the tie.
5. Metal and wooden spreaders which are separate from the forms shall be wired to top of form and shall be entirely removed as the concrete is placed.
6. In the construction of basement or water bearing walls, the portion of a single rod tie that is to remain in the concrete shall be provided with a tightly fitted washer at midpoint to control seepage. Multi-rod ties do not require washers. The use of form ties which are tapered on encased in paper or other material to allow the removal of complete tie, and which leave a hole through the concrete structure, shall not be permitted.

G. Falsework:

1. Falsework shall be designed and constructed so that no excessive settlement or deformation occurs. Falsework shall provide necessary rigidity.
2. Timber used in falsework centering shall be sound, in good condition and free from defects which impair its strength.
3. Steel members shall be of adequate strength and shape for the intended purpose.
4. Timber piling used in falsework may be of any wood species which satisfactorily withstands driving and which adequately supports the superimposed load.
5. When sills or timber grillages are used to support falsework columns, unless founded on solid rock, shale or other hard materials, place them in excavated pits. Backfill to prevent the softening of the supporting material from form drip or from rains that may occur during the construction process. Sills or grillages shall be of ample size to support the superimposed load without settlement.
6. Falsework not founded on a satisfactory spread footing shall be supported on piling, which shall be driven to a bearing capacity to support the superimposed load without settlement.

3.00 EXECUTION

3.01 PREPARATION

- A. Before placing concrete, insure that embedded items are correctly, firmly and securely fastened into place. Embedded items shall be thoroughly clean and free of oil and other foreign material. Anchor bolts shall be set to the correct location, alignment and elevation by the use of suitable anchor bolt templates.

3.02 INSTALLATION

A. Pre-Placement:

1. During the elapsed time between building the forms and placing the concrete, maintain the forms to eliminate warping and shrinking.
2. Treat the facing of forms with suitable form oil before concrete is placed. Apply oil before the reinforcement is placed. Wet form surfaces which will come in contact with the concrete immediately before the concrete is placed.
3. At the time of placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust, and other extraneous matter at the time. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of foreign matter during concrete placement.

B. Placement:

1. Set and maintain forms to the lines designated, until the concrete is sufficiently hardened to permit form removal. If, at any stage of the work, the forms show signs of bulging or sagging, immediately remove that portion of the concrete causing this condition. If necessary, reset the forms and securely brace against further movement.
2. Provide adequate cleanout openings where access to the bottom of the forms is not otherwise readily attainable.
3. Carefully and accurately place and support reinforcement in concrete structures.

- C. Removal: Remove forms so that the underlying concrete surface is not marred or damaged in any way. Forms shall not be removed until the concrete has attained sufficient strength to safely carry the dead load, but in no case less than the number of curing days set forth in the following table:

Forms for concrete of minor structural load carrying importance	1 day
Forms for walls, columns, sides of drilled shafts, massive structural components and other members not resisting a bending moment during curing	1 day
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans < or = 10 feet)	7 days
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans > 10 feet and < or = 20 feet)	14 days

END OF SECTION

03 21 00 REINFORCING STEEL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor and reinforcing materials required to cut, bend, tie, splice, place and support the reinforcement in the material grades, sizes, quantities and locations specified.

1.02 QUALITY ASSURANCE

- A. Tolerances: Reinforcement shall be placed where specified, with the following maximum tolerances, plus or minus:
1. Concrete Cover: 1/4 inch.
 2. Rebar Spacing: 1/4 inch in 12 inches.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01330 "Document Management" and shall include:
1. Shop Drawings: Reinforcing bar layout drawing with bar lists clearly marked and referenced to the Drawings.
 2. Record Data: Manufacturers' literature for specified products.
 3. Certified Test Reports: Certification of steel quality, size, grade and manufacturer's origin.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
1. ASTM International (ASTM) Standards:

ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

2. American Concrete Institute (ACI) Publications:

ACI 301	Specification for Structural Concrete
ACI SP-66	ACI Detailing Manual
ACI 318	Building Code Requirements for Structural Concrete

3. Concrete Reinforcing Steel Institute (CRSI) Publications:

CRSI	Manual of Standard Practice
------	-----------------------------

1.05 DELIVERY AND STORAGE

- A. Store steel reinforcement above the surface of the ground upon platform skids or other supports. Protect from mechanical and chemical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the Work, steel reinforcement shall be free from dirt, scale, dust, paint, oil and other foreign material. Tag and store steel reinforcement for ease of correlation with Shop Drawings.

1.06 JOB CONDITIONS

- A. Proposed deviations from reinforcing indicated on the Drawings or Specifications shall be approved in writing by the Engineer prior to fabrication.
- B. Lap lengths shall be of the length shown on the Drawings or noted in lap and embedment table, and shall be in compliance with ACI 318.
- C. Specified cover for reinforcing shall be maintained throughout construction. Bars shall be cut to lengths necessary to allow for proper clearances. Cover of concrete shall be measured from face of forms to outside face of reinforcement.
- D. Stirrups shall be hooked.

2.00 PRODUCTS

2.01 MATERIALS

- A. Steel Reinforcing Bars: Billet-Steel bars for concrete reinforcement conforming to ASTM A615, Grade 60, with minimum yield strength of 60,000 psi. Steel reinforcing bars shall be produced in the United States of America.
- B. Welded Wire Reinforcement: Cold-drawn steel wire conforming to ASTM A1064; flat sheets fabricated in accordance with ASTM A1064.
- C. Supports (Chairs): Bar supports shall be of the proper type for the intended use. Bar supports shall be uniform high density polyethylene (plastic) or fiberglass reinforced plastic (FRP) conforming to CRSI Class 1, Maximum Protection.
- D. Spacers: Precast mortar blocks with a 28-day compressive strength that is greater than the specified concrete strength in which the blocks are being placed.
- E. Mechanical Bar Splices: Cadweld splices as manufactured by Erico Products, Inc., or approved equal, installed in strict accordance with the manufacturer's instructions and recommendations. The mechanical devices shall develop at least 125 percent of the specified yield of the spliced bars.
- F. Mechanical Threaded Splices: Mechanical threaded connections shall utilize a metal coupling sleeve with internal threads which engage threaded ends of the bars to be spliced and shall develop in tension or compression 125 percent of the specified yield strength of the bar.

2.02 FABRICATIONS

- A. Bending: Reinforcement shall be bent cold by machine to shapes indicated on the Drawings; true to shapes indicated; irregularities in bending shall be cause for rejection. Unless

otherwise noted, all hook and bend details and tolerances shall conform to the requirements of ACI SP-66 and ACI 318.

3.00 EXECUTION

3.01 PREPARATION

- A. Before any concrete is placed, all mortar blocks to be used for holding steel in position adjacent to formed surfaces shall be cast in individual molds, after which time the blocks shall be immersed in water for the remainder of at least a 4-day curing period. The blocks shall be cast with the sides beveled and in such a manner that the size of the block increases away from the surface to be placed against the forms. Blocks shall be in the form of a frustum of a cone or pyramid. Suitable tie wires shall be provided in each block for anchoring the block to the reinforcing steel, and to avoid displacement when placing the concrete. The size of the surface to be placed adjacent to the forms shall not exceed 2-1/2 inches square or the equivalent thereof when circular or rectangular areas are provided. Blocks shall be accurately cast to the thickness required, and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.

3.02 INSTALLATION

- A. General: Place the reinforcement carefully and accurately in the concrete structures. Rigidly tie and support the reinforcement. Welding of any type of reinforcement shall not be permitted.
- B. Splices:
 - 1. Splicing of bars, except where indicated on the Drawings, shall not be permitted unless approved by the Engineer prior to fabrication. Splices shall be kept to a minimum. Splices shall preferably occur at points of minimum stress. Lap splices which are permitted shall have a lap in accordance with ACI 318. Rigidly clamp or wire the bars at all splices, in accordance with ACI. Overlap sheets of wire fabric sufficiently to maintain a uniform strength and securely fasten.
 - 2. Welding of reinforcing steel splices shall not be permitted.
 - 3. Make mechanical splices where shown on the Drawings using Cadweld splices or approved equal, installed in accordance with the manufacturer's instructions and recommendations. The mechanical device shall develop at least 125 percent of the specified yield strength of the bar.
- C. Placement:
 - 1. Place steel reinforcement, as indicated on the Drawings with the specified tolerances. Hold securely in place during the placing of the concrete. The minimum clear distance between bars shall be per ACI 318 unless noted otherwise. Always pass vertical stirrups around the main tension members and securely attach thereto. Wire reinforcing together at a sufficient number of intersections to produce a sound, sturdy mat or cage of reinforcement that will maintain the reinforcement in correct positions when the concrete is placed.

2. Hold the reinforcing steel in concrete slabs firmly in place with wire supports or “chairs.” Sizing and spacing of the chairs shall be sufficient to properly support the steel, and shall be in accordance with CRSI Publications “Manual of Standard Practice in.”
3. Space the reinforcing steel in concrete walls the proper distance from the face of the forms, as indicated on the Drawings:
 - a. For wall surfaces exposed to view, use chairs.
 - b. For wall surfaces not exposed to view, use chairs or precast mortar blocks.
4. Where reinforcing conflicts with location of anchor bolts, inserts, etc., submit prompt notifications so that revisions can be made before concrete is placed. No cutting of reinforcing shall be permitted without the prior approval of the Engineer.
5. Welded wire shall be fabricated flat sheets, in longest practical lengths. Lap joints one mesh. Do not locate end laps over beams of continuous structures or midway between supporting beams. Offset end laps of adjacent widths to prevent continuous lap. Fasten ends and sides of welded wire fabric at 48 inches o.c. with tie wire.
6. Reinforcing shall extend through construction joints.

3.03 FIELD QUALITY CONTROL

- A. Concrete shall not be placed until the Engineer has observed the final placing of the reinforcing steel, and has given permission to place concrete.

END OF SECTION

03 30 00 CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, mixing and transporting equipment and incidentals necessary to proportion, mix, transport, place, consolidate, finish, and cure concrete in the structure.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, slag cement, silica fume, and metakaolin; subject to compliance with requirements.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings:
 - a. Mix design: For each concrete mix, complete the form "Concrete Mix Design" and one of the following forms: "Documentation of Required Average Strength – Field Strength Test Record" or "Documentation of Average Strength – Trial Mixtures."
 - b. Submit a schedule to the Owner's representative which shows the sequence of concrete placements.
 - 2. Certified Test Reports:
 - a. Materials used in the trial mix design.
 - b. Water: Verification that all potable mix water and curing water sources do not exceed the non-potable water limits listed in ASTM C1602 Table 2.
 - c. Aggregate, conforming to ASTM C33, including the test reports for soundness and abrasion resistance.
 - d. Aggregate:
 - 1). Verification that aggregate is not "potentially reactive" per ASTM C1260.
 - 2). Or a cement chemical analysis indicating that the total alkali content is acceptable per Paragraph 2.02.A.
 - 3). When mix water exceeds 50 percent of the chloride limit indicated in ASTM C1602 Table 2, then all aggregate sources shall be tested for chloride content in accordance with ASTM C1218.
 - e. 7-day and 28-day compressive strength tests results.
 - 1). When more than 15, 28-day compressive tests results are available from the current Project for a given class of concrete, include the 15-test running average compressive strength versus the required average compressive strength (based on the previous 15 tests) in graphical form.

- f. If the sum total of chlorides in mix water and aggregates exceeds 80 percent of the specified limit for hardened concrete, then prior to use of concrete, test mix design to verify acceptable chloride ion concentrations in accordance with ASTM C1218.
- 3. Record Data:
 - a. Manufacturer's literature on specified materials.
 - b. Documentation indicating conformance with ASTM C94 requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications:
 - 1. A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
 - 2. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications:
 - 1. An independent testing agency, acceptable to authorities having jurisdiction and the Engineer, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated.
 - 2. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cement in bulk or bags which are plainly marked with the brand and manufacturer's name. Immediately upon receipt, store cement in a dry, weather-tight, and properly ventilated structure which excludes moisture. Storage facilities shall permit easy access for inspection and identification. Cement not stored in accordance with the requirements shall not be used.
- B. Sufficient cement shall be in storage to complete placement of concrete started. In order that cement may not become unduly aged after delivery, maintain records of delivery dates. Use cement which has been stored at the Site for 60 days or more before using cement of lesser age. No cement shall be used which is lumped, caked, stored more than 90 days, or whose temperature exceeds 170 F.

1.06 STANDARDS

- A. Mixing, sampling, placing, curing and testing of concrete, and the materials used shall be in compliance with the latest revisions of the following standards, unless otherwise noted in

the Contract Documents. The Contractor shall maintain one copy of each of the applicable standards at the construction field office.

1. ASTM International (ASTM) Standards:

ASTM Standards	
ASTM C31	Standard Practice for of Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C87	Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM C94	Standard Specification of Ready Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C125	Standard Terminology Relating to Concrete and Concrete Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C156	Standard Test Method for Water Loss [from a Mortar Specimen] Through Liquid Membrane-Forming Curing Compounds for Concrete
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C191	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete

ASTM Standards	
ASTM C579	Standard Test Methods for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C580	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C806	Standard Test Method for Restrained Expansion of Expansive Cement Mortar
ASTM C827	Standard Test Method for Change in Height at Early Stages of Cylindrical Specimens of Cementitious Mixtures
ASTM C845	Standard Specification for Expansive Hydraulic Cement
ASTM C878	Standard Test Method for Restrained Expansion of Shrinkage Compensating Concrete
ASTM C881	Standard Specification for Epoxy Resin Base Bonding Systems for Concrete
ASTM C1116	Standard Specification for Fiber-Reinforced Concrete
ASTM C1218	Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	Standard Specification for Silica Fume used in Cementitious Mixtures
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D746	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D994	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2240	Standard Test Method for Rubber Property Durometer Hardness
ASTM D6690-07	Standard Specification for Joint and Crack Sealant, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials

2. American Concrete Institute (ACI) Standards:

ACI Standards	
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavy-weight, and Mass Concrete
ACI 301	Specification for Structural Concrete
ACI 304	Guide for Measuring, Mixing, Transporting & Placing Concrete
ACI 305.1	Specification for Hot Weather Concreting
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 308.1	Specification for Curing Concrete
ACI 318	Building Code Requirements for Structural Concrete

3. Federal Specification:

- a. TT S 00227E - Type II, Class A or B, Expansion Joint Sealant.

4. Concrete Plant Manufacturers Bureau (CPMB) Standards:

- a. Concrete Plant Standards.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 CONCRETE MATERIALS

- A. Cementitious Material; General: If the fine and/or coarse aggregates test "Potentially Reactive", in accordance with ASTM C1260, then a low alkali cementitious material shall be used. A low alkali cementitious material shall be such that, the Sodium Oxide Equivalent ($N_{a_2O_{eq}}$) shall not exceed 0.6 percent of the total cementitious material content.
- B. Cement; Type: Type I or I/II Portland cement, conforming to ASTM C150; used for all concrete, unless noted otherwise.

C. Supplementary Cementitious Materials (SCM):

1. Fly Ash/Pozzolans: Conforming to ASTM C618, Class F fly ash; used in all classes of concrete. If fly ash is not available then provide a straight cement mix.

D. Coarse Aggregate:

1. Crushed stone or gravel conforming to ASTM C33, in the gradation size specified.
 - a. Aggregate shall have a coefficient of thermal expansion (CoTE) of 4.5 microstrain per degree Fahrenheit.
2. For gradation size number 467, a maximum aggregate size of 1-1/2 inches is:

Sieve Size	Percent Retained	Percent Passing
2"	0	100
1-1/2"	0-5	95-100
3/4"	30-65	35-70
3/8"	70-90	10-30
No. 4	95-100	0-5

3. For gradation size number 57, the maximum aggregate size of 1 inch is:

Sieve Size	Percent Retained	Percent Passing
1-1/2"	0	100
1"	0-5	95-100
1/2"	40-75	25-60
No. 4	90-100	0-10
No. 8	95-100	0-5

4. For gradation size number 67, the maximum aggregate size of 3/4 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/4"	0-10	90-100
3/8"	45-80	20-55
No. 4	90-100	10-10
No. 8	90-100	0-5

E. Fine Aggregate:

1. Washed and screened natural sands or sands manufactured by crushing stones; conforming to ASTM C33. The gradation in ASTM C33 for air entrained concrete is:

Sieve Size	Percent Retained	Percent Passing
3/8"	0	100
#4	0-5	95-100

Sieve Size	Percent Retained	Percent Passing
#8	0-20	80-100
#16	15-50	50-85
#30	40-75	25-60
#50	70-90	10-30

2. Fine aggregate shall have not more than 45 percent retained between any two consecutive sieves. Its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

F. Water: Potable and complying with ASTM C1602 and ASTM C1602 Table 2.

2.03 ADMIXTURES

- A. Measure and dose admixtures in accordance with manufacturer's recommendations.
- B. Air Entraining Admixture: Conforming to ASTM C260.
- C. Water Reducing Admixtures: Conforming to ASTM C494; Types A or D.
- D. Set Retarding Admixtures: Conforming to ASTM C494; Types B and D.
- E. Water Reducing Admixtures, High Range (HRWR): High Range Water Reducer shall comply with ASTM C494, Type F or G. HRWR shall be added to the concrete mix at the concrete batch plant. HRWR may not be added at placement site except to redose a batch and only after approval of the HRWR manufacturer. The high range water reducing admixture shall be able to maintain the plasticity range without significant loss of slump or rise in concrete temperature for 2 hours. Other admixtures may only be used with the HRWR if approved by the HRWR manufacturer. A representative of the HRWR manufacturer shall be present during any large placement, placement of slabs, or during times of unusual circumstance which may require changes to the product formulation.
 1. Manufacturers:
 - a. BASF Corporation.
 - b. GCP Applied Technologies.
 - c. Sika Corporation.

2.04 WATERSTOPS

- A. Self-Expanding Strip Waterstops (Hydrophilic): Self-expanding strip waterstops shall be used only where specifically indicated. Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
 1. Products:
 - a. Adeka Ultra Seal; Mitsubishi International Corporation.
 - b. Sika Hydrotite; Sika Corporation – U.S.
- B. Steel Waterstops: Steel waterstops shall be 1/4-by-4-inch steel plates. Steel shall be ASTM A36. Plates shall be continuous.

2.05 CURING MATERIALS

- A. Sheet Curing Material: Conforming to ASTM C171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. White burlap - polyethylene film.
- B. Membrane Curing Compounds: Membrane curing compound conforming to ASTM C309; having a color to indicate coverage when applied; non-staining; applied according to the manufacturer's recommendations. No curing compound shall be used on walls which are to receive a plaster mix finish. When tested according to ASTM C156, the curing compound shall provide a film which has retained, within the specimen, the following percentages of moisture present when the curing compound was applied:
 - 1. At least 97 percent at the end 24 hours.
 - 2. At least 95 percent at the end of 3 days.
 - 3. At least 91 percent at the end of 7 days.
- C. Concrete Curing and Sealing Compound:
 - 1. Where a sealer is necessary, use a concrete curing and sealing compound. Application of this product shall be in accordance with the manufacturer's recommendations.
 - a. Interior Concrete Surfaces: MasterKure CC 200 WB by BASF Corporation, or approved equal.
 - b. Exterior Concrete Surfaces With Prolonged UV Exposure: MasterKure CC 1315 WB by BASF Corporation, or approved equal.
 - c. Concrete Surfaces Exposed to Chemicals: MasterKure HD 200 WB by BASF Corporation, or approved equal.
- D. Finishing Aid: Spraying material designed to form a monomolecular film on fresh concrete that reduces the rate of evaporation of surface moisture prior to finishing; conforming to MasterKure ER 50 by BASF Corporation, or approved equal. This material is not a curing compound. Concrete must be cured as specified.

2.06 RELATED MATERIALS

- A. Joint Materials for Water-Retaining Structures:
 - 1. Pre-molded, resilient, non-bituminous expansion joint filler conforming to ASTM D1752, Type "II", in the thickness specified.
 - 2. Joint sealer conforming to ASTM D6690.
 - 3. Expansion joint sealant for non-potable water shall be a two-component, non-sag, polysulfide-base, elastomeric sealing compound. The material shall conform to Federal Specification TT S 00227E, Type "II", Class B; installed according to the manufacturer's recommendations. Backing material for sealant shall be a rod of a diameter and composition recommended by the sealant manufacturer.

4. Expansion joint sealant for potable water shall be a two-component, non-sag, polysulfide sealant containing no lead or mercury; conforming to Fed. Spec. TT S 00227E, Type "II", Class A; applied according to the manufacturer's specifications. Backing material for sealant shall be a rod of a diameter and composition recommended by the sealant manufacturer.
 5. Where surface is to receive a swept in grout topping, a 3-inch wide, 1-mil polyethylene strip shall be placed above the joint sealant and held in place with 1-inch wide polyethylene tape spaced at 12-inch centers (maximum).
- B. Joint Materials for Non-Water-Retaining Structures:
1. Bituminous-type, preformed, expansion joint filler; conforming to ASTM D994.
 2. Pre-molded, resilient, non-bituminous expansion joint filler conforming to ASTM D1752, Type "II", in the thickness specified.
- C. Bonding Agents: Install according to the manufacturer's recommendations and written instructions.
1. Products:
 - a. Sika Armatex 110 EpoCem by Sika Corporation.
 - b. Sikadur 32, Hi-Mod by Sika Corporation.
 - c. Approved equal.
- D. Non-Shrink Grout:
1. General: Non-shrink grout for grouting of pump, motor, and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates, piping block outs and other uses of grout. Grout shall meet the following requirements, as verified by independent laboratory tests:
 - a. No shrinkage from the time of placement, or expansion after set, under ASTM C827 and CRD C621 83 (Corps of Engineers). When non-shrink grouts are tested under CRD C621 83, the grout shall be tested in a fluid state. A fluid state shall be defined as flowing through a flow cone at a rate of 20 seconds, plus or minus 5 seconds.
 - b. An initial set time of not less than 45 minutes under ASTM C191.
 2. Non-Shrink Non-Metallic Grout: Pre-mixed, non-staining, non-shrink grout; minimum 28-day compressive strength of 5000 psi.
 - a. Do not use for vibrating equipment.
 - b. Products:
 - 1). MasterFlow 100 by BASF Corporation.
 - 2). Five Star Grout by Five Star Products, Inc.
 - 3). SikaGrout 212 by Sika Corporation.
 3. Non-Shrink Epoxy Structural Grouts: Furnished in two components from the factory and mixed on the Site; conforming to ASTM C579, ASTM C580, and ASTM C827; chemical resistant, water resistant and a minimum 7-day compressive strength of 12,000 psi.

- a. Use for vibrating equipment.
 - b. Products:
 - 1). Sikadur 42, Grout-Pak by Sika Corporation.
 - 2). Five Star HP Epoxy Grout by Five Star Products, Inc.
 - 3). MasterFlow 648 by BASF Corporation.
- E. Normal Shrinkage Grout: 1 part Portland cement, Type I or I/II, to 3 parts of clean, first quality sand; proportioning on a volumetric basis; used for non-structural applications for grouting areas as shown on the Drawings which do not require non-shrink grout.
- F. Foundation Waterproofing: Foundation coating shall be used only on the exterior of concrete walls not exposed to view where indicated on the Drawings.
 - 1. Products:
 - a. MasterSeal 581 (Thoroseal) as manufactured by BASF Corporation.
 - b. TREMproof 250GC as manufactured by Tremco Commercial Sealants and Waterproofing.
 - c. Approved Equal.
- G. Zinc Rich Primer: Aluminum surfaces which contact or are embedded in concrete shall be coated with zinc rich primer. Primer shall be Tneme-Zinc by Tnemec or MasterProduct P 8100AP by BASF Corporation.

2.07 REPAIR MATERIALS

- A. Structural Concrete Repair Material: Low-shrink, non-slump, non-metallic, quick setting patching mortar; as approved by the manufacturer for each application and applied accordance with the manufacturer's recommendations.
 - 1. Products:
 - a. Five Star Structural Concrete by Five Star Products, Inc.
 - b. Sikatop 123 by Sika Corporation.
 - c. Sikatop 122 by Sika Corporation.
 - d. Approved equal.

2.08 CONCRETE MIXTURES

- A. Design Criteria:
 - 1. Provide a mix design for each concrete application indicated. This may necessitate multiple mix designs for each class of concrete depending on HRWR, entrained air, and other requirements.
 - 2. All Concrete shall be normal weight concrete composed of Portland cement, fine aggregate, coarse aggregate, admixtures, and water, as specified.

3. ACI 211.1 shall be the basis for selecting the proportions for concrete made with aggregates of normal and high density and of workability suitable for usual cast in place structures.
4. The workability of any mix shall be as required for the specific placing conditions and the method of placement. The concrete shall have the ability to be worked readily into corners and around reinforcing steel without the segregation of materials or the collection of free water on the surface. Compliance with specified slump limitations shall not necessarily designate a satisfactory mix.
5. In no case shall the amount of coarse material produce harshness in placing or honeycombing in the structure, when forms are removed.
6. The maximum amount of coarse aggregate (dry loose volume) per cubic foot of finished concrete shall not exceed 0.82 cubic feet.
7. In calculating water-cement ratio: The water content shall include the amount of water batched or to be added later, plus the free water in the aggregate, and minus the water content at SSD conditions.
8. No allowance shall be made for the evaporation of water after batching. If additional water is required to obtain the desired slump, a compensating amount of cement shall also be added. In no case shall the maximum water cement ratio exceed the specified maximum or that of the approved mix design.
9. Air Entrainment: Provide the percent air entrainment in each concrete mix design as recommended by ACI 318 for "Moderate Exposure" (Class F1), unless otherwise specified/restricted:
 - a. Do not provide air-entrainment and entrapped air shall not exceed 3 percent for the following applications:
 - 1). Interior slabs.
10. When job conditions dictate, water-reducing and set-controlling admixtures may be used. Only specified admixtures shall be used. Admixtures shall be batched at the batch plant.
11. High Range Water Reducer (HRWR): Provide HRWR in mix designs as indicated for specified applications. Slump of concrete with the addition of HRWR may be increased to 8 inches (+/- 1 inch).
 - a. Footings, walls, columns, and beams.
 - b. Precast concrete.
 - c. Do not provide HRWR in slabs and pavement (a water reducer is permitted provided performance requirements are met).
12. If fly ash is to be used in place of cement, no more than 25 percent of the cement may be replaced.
13. Concrete shall be capable of developing two-thirds of the required 28-day compressive strength in 7 days.
14. Maximum water-soluble chloride ion content in concrete, by percent weight of concrete, shall not exceed ACI 318 and ACI 350 limits for Exposure Class C1.

B. Concrete Classifications:

Class	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (inches)	Max. Water: Cementitious Materials Ratio	Slump +/-1 (inches)	Min. Sacks of Cement Per Cubic Yard **
A	4000	1.5 Size No. 467	0.45	3 (8*)	5.75
B	3000	1.5 Size No. 467	0.47	3	5.75
C	4000	1.0 Size No. 57	0.45	4 (8*)	5.75
E	1500	1.5 Size No. 467	0.70	4	4.00
* Slump shown is with HRWR ** Provide one additional sack of cement per cubic yard if concrete must be deposited in standing water.					

C. Concrete Usage:

Class	Usage
Class A Use	Footings and slabs, and other unless noted otherwise
Class B Use	Pavement, gutters, and sidewalks
Class C Use	Walls, columns, beams
Class E Use	Cradling, blocking, mud slab, lean concrete backfill

D. Required Average Compressive Strength:

1. All concrete is required to have an average compressive strength greater than the specified strength. The required average compressive strength shall be established according to the requirements of ACI 301.
2. Standard Deviation: If the production facility has records of field tests performed within the past 12 months and spanning a period of not less than 60 calendar days for a class of concrete within 1000 psi of that specified for the Work, calculate a standard deviation and establish the required average strength f_{cr}' in accordance with ACI 301. If field test records are not available, select the required average strength from ACI 301.

E. Documentation of Required Average Compressive Strength:

1. Documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength, shall consist of field strength records or trial mixture.

2. Field Strength Records: Document field strength records according to ACI 301 and including the following:
 - a. Field test data shall not be older than 1 year.
 - b. If field test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 60 days, verify that the average of the field test results equals or exceeds f_{cr}' . Submit for acceptance the mixture proportions along with the field test data.
 - c. If the field test data represent two groups of compressive strength tests for two mixtures, plot the average strength of each group versus the water-cementitious materials ratio of the corresponding mixture proportions and interpolate between them to establish the required mixture proportions for f_{cr}' .
3. Trial Mixtures:
 - a. Establish trial mixture proportions according to ACI 301 and including the following.
 - 1). Make at least three trial mixtures complying with performance and design requirements. Each trial mixture shall have a different cementitious material content. Select water-cementitious materials ratios that will produce a range of compressive strengths encompassing the required average compressive strength f_{cr}' .
 - 2). Submit a plot of a curve showing the relationship between water-cementitious materials ratio and compressive strength.
 - 3). Establish mixture proportions so that the maximum water-cementitious materials ratio is not exceeded when the slump is at the maximum specified.
 - b. Laboratory Samples shall be taken in accordance with the trial mix designs for laboratory testing purposes.
 - c. The fresh concrete shall be tested for Slump (ASTM C143) and Air Content (ASTM C173 and ASTM C231). Strength test specimens shall be made, cured, and tested for 7-day and 28-day strength in accordance with ASTM C192, ASTM C39, and ASTM C78.
 - d. Suitable facilities shall be provided for readily obtaining representative Samples of aggregate from each of the weigh batchers for test purposes and for obtaining representative Samples of concrete for uniformity tests. The necessary platforms, tools, and equipment for obtaining Samples shall be furnished. Aggregates shall be tested in accordance with ASTM C1260.
 - e. The cement contents specified are minimum values. If additional quantities are required to obtain the specified strengths, supply the cement at no additional cost to the Owner.
 - f. A trial mix shall be designed by an independent testing laboratory, retained and paid by the Contractor and approved by the Owner. The testing laboratory shall submit verification that the materials and proportions of the trial concrete mix design meet the requirements of the Specifications.

- g. From these trial mix tests, the ratios between 7-day and 28-day strengths shall be established. The 7-day strength which corresponds to the required 28-day strength shall be determined.
 - h. The final results of the trial mix design shall be submitted to the Engineer at least 10 days prior to the scheduled beginning of concrete placement and shall be approved by the Engineer prior to the placement of any concrete.
4. Revisions to concrete mixtures:
- a. When less than 15 compressive strength tests results for a given class of concrete are available from the current Project:
 - 1). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.
 - a). A 7-day compressive strength test result multiplied by 1.5 falls below the required 28-day compressive strength.
 - b). A 28-day compressive strength test result is deemed not satisfactory.
 - b. When at least 15 compressive strength test results for a given class of concrete become available from the current Project:
 - 1). Calculate the actual average compressive strength, standard deviation and required average compressive strength using the previous 15 consecutive strength tests. Submit results in graphical form with each 28-day test result for that class of concrete.
 - 2). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.
 - a). A 7-day compressive strength test result multiplied by the average job-to-date ratio of 7-day to 28-day compressive strength falls below the required 28-day compressive strength.
 - b). A 28-day compressive strength test result is deemed not satisfactory.
 - c). The average compressive strength falls below the required average compressive strength.
 - c. When revisions to the mix design are required, notify the Engineer in writing of the corrective actions taken.

2.09 OFF-SITE BATCH PLANT

- A. Batch plants shall be an established concrete batching facility meeting the requirements of the Concrete Plant Standards of the Concrete Plant Manufacturers Bureau.

2.10 CONCRETE MIXING

- A. Mixers may be stationary, truck, or paving mixers of approved design. They shall be capable of combining the materials into a uniform mixture and of discharging without mixture segregation. Stationary and paving mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixers or mixing plant shall include a device for automatically counting the total number of batches of

concrete mixed. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer on the name plate.

- B. The mixing time for stationary mixers shall be based upon the mixer's ability to produce uniform concrete throughout the batch and from batch to batch. For guidance purposes, the manufacturer's recommendations, or 1 minute for 1 cubic yard plus 1/4 minute for each additional cubic yard may be used. Final mixing time shall be based on mixer performance. Mixers shall not be charged in excess of the capacity specified by the manufacturer.
- C. When a stationary mixer is used for partial mixing of the concrete (shrink mixed), the stationary mixing time may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).
- D. When a truck mixer is used, either for complete mixing (transit-mixed) or to finish the partial mixing in a stationary mixer and in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum, at the rate of rotation designated by the manufacturer of the equipment as mixing speed. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to no less than 50. Additional mixing shall be performed at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing of transit-mixed concrete shall not be permitted until the truck mixer is at the Site of the concrete placement. Truck mixers shall be equipped with accurate revolution counters.
- E. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket to catch any concrete spillage that may occur when the mixer is discharging concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized. The mixing time shall be determined by time required to transfer the concrete between compartments of the drum.
- F. Vehicles used in transporting materials from the batching plant to the paving mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separated and intact, to the mixer. Cement shall be transported from the batching plant to the mixers in separate compartments which are equipped with windproof and rain proof covers.

3.00 EXECUTION

3.01 PREPARATION

- A. Notify the Owner's representative upon completion of various portions of the work required for placing concrete, so that inspection may be made as early as possible. Keep the Owner's representative informed of the anticipated concrete placing schedules.
- B. All items, including lines and grades, forms, waterstops, reinforcing, inserts, piping, electrical, plumbing and the Contractor's concreting materials and equipment shall be in compliance with the Contract Documents before proceeding.
- C. Do not place any concrete until formwork and the placing reinforcement in that unit is complete. Place no concrete before the completion of all adjacent operations which might prove detrimental to the concrete.

- D. Brilliantly light the Site so that all operations are plainly visible when concrete mixing, placing, and finishing, continues after daylight. Whenever possible, concrete finishing shall be completed in daylight hours.
- E. When placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust and other extraneous matter. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails, or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of any foreign matter during concrete placing.
- F. The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the time limits specified shall not be used. Concrete shall not be re-tempered.
- G. Concrete shall not be placed if impending weather conditions would impair the quality of the finished Work.
- H. Unless otherwise provided, the following requirements shall govern the time sequence on which construction operations shall be carried.
 - 1. Forms for walls or columns shall not be erected on concrete footings until the concrete in the footing has cured for at least 2 curing days. Concrete may be placed in a wall or column as soon as the forms and reinforcing steel placements are approved.
 - 2. Steel beams or forms and falsework for superstructures shall not be erected on concrete substructures until the substructure concrete has cured for at least 4 curing days. Falsework required for superstructures shall not be erected until the substructure has cured for 4 curing days, and shall not be removed until the superstructure has cured.

3.02 EMBEDDED ITEMS

- A. Where aluminum anchors, aluminum shapes, or aluminum electrical conduits are embedded in concrete, paint aluminum contact surfaces with zinc rich primer. Allow the paint to thoroughly dry before placing the aluminum in contact with the concrete.
- B. Paint steel or other ferrous metal to be mounted on or placed in contact with dry/cured concrete, and coat in accordance with Section 09 96 00.01 "High-Performance Coatings" prior to installation.

3.03 JOINTS

- A. Expansion Joints and Devices:
 - 1. Workmanship: Exercise careful workmanship in joint construction to separate the concrete sections by an open joint or by the joint materials, and make the joints true to the outline indicated.
 - 2. Expansion Joints: Construct expansion joints and devices to provide expansion and contraction. Construct joints which are to be left open or filled with poured joint material with forms which are adaptable for loosening or early removal. In order to avoid jamming by the expansion action of the concrete and the consequent likelihood of injuring adjacent concrete, remove or loosen these forms as soon as possible after the concrete has initially set. Make provisions for loosening the forms to permit free concrete expansion without requiring full removal.

3. Armored Joints: Carefully construct armored joints to avoid defective anchorage of the steel and porous or honeycombed concrete adjacent to same. Anchor pre-molded materials to the concrete on one side of the joint with approved adhesive. Anchor so that the material does not fall out of the joint.
- B. Construction Joints:
1. Construction joints are formed by placing plastic concrete in direct contact with concrete which has attained its initial set. When concrete is specified as monolithic, the term shall be interpreted as the manner and sequence of concrete placement so that construction joints do not occur.
 - a. Unless noted otherwise, the maximum horizontal spacing of construction joints shall be 40 feet.
 - b. For slabs on grade, the maximum spacing between two construction joints or between a construction joint and a control joint or between two control joints shall be 15 feet, unless noted otherwise.
 - c. Unless noted otherwise or approved by the Engineer, the maximum vertical spacing of construction joints shall be 15 feet. If not detailed on the Drawings, construction joint details and locations shall be submitted to the Engineer for approval.
 2. Additional horizontal and vertical construction joints, when submitted and approved by the Engineer, may have an impact on reinforcing details. Revise reinforcing details to reflect additional joints.
 3. Unless otherwise provided, construction joints shall be square and normal to the forms. Provide bulkheads in the forms for all joints except horizontal joints.
 4. At the proper time, clean horizontal construction joints for receiving the succeeding lift using air water cutting. The surface shall be exposed sound, clean aggregate. The air pressure supply to the jet shall be approximately 100 lb. per square inch, and the water pressure sufficient to bring the water into effective influence of the air pressure. After cutting, wash the surface until there is no trace of cloudiness in the wash water.
 5. In areas where air water cutting cannot be satisfactorily accomplished, or in areas where it is undesirable to disturb the surface of the concrete before it has hardened, prepare the surface for receiving the next lift by wet sand blasting to immediately remove all laitance and unsound concrete prior to placing of the next lift. Thoroughly wash the surface of the concrete after sand blasting to remove all loose material.
 6. Provide construction joints with concrete keyways, reinforcing steel dowels, and waterstops. The method of forming keys in keyed joints shall permit the easy removal of forms without chipping, breaking, or damaging the concrete.
- C. Existing Hardened Concrete: Where new concrete or grout is to be placed in contact with existing hardened concrete, texture the existing surface by chipping or other means so that an irregular surface having a height variance of not less than 1/4 inch is created. The existing concrete shall then be coated with a bonding agent and new concrete or grout placed.

3.04 WATERSTOPS

A. Self-Expanding Strip Waterstops:

1. Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place.
 - a. Waterstop shall be bonded to the substrate using a continuous bead of swelling sealant or adhesive as recommended by the manufacturer.
 - 1). ADEKA Ultra Seal P-201.
 - 2). Sika Leakmaster.
2. Install in longest lengths practicable.
3. Protect from moisture, oil, dirt, and sunlight prior to the placement of concrete. Coordinate with manufacturer for additional requirements.

B. Steel Waterstops:

1. Splices shall be factory made, where possible. Splices shall be water-tight, with ends of joined pieces in true alignment.
2. Install waterstops to form a continuous watertight diaphragm in each joint.
3. Correctly position waterstops in the forms and adequately support forms to prevent movement or disturbance during the placing of concrete.

3.05 CONCRETE PLACEMENT

A. Cold Weather:

1. If air temperature has fallen to, or is expected to fall below 40 F during the protection period (a minimum of 48 hours unless longer time frame is recommended by ACI 306R), then cold weather concreting shall be performed in accordance with ACI 306.1.
2. In cases where the temperature drops below 40 F after the concreting operations have been started, sufficient canvas and framework or other type of housing shall be furnished to enclose and protect the structure, in accordance with the requirements of ACI 306R. Sufficient heating apparatus to provide heat shall be supplied, and heating source and protection from combustion gas shall be in accordance with ACI 306.1. The concrete shall be protected when placed under all weather conditions. Should concrete placed under such conditions prove unsatisfactory, remove and replace the concrete at no cost to the Owner.
3. When the air temperature is above 30 F:
 - a. The minimum concrete temperature at the time of mixing shall be 60 F unless other requirements of ACI 306.1 are met, which may allow for a lower mix temperature.
 - b. The minimum concrete temperature at the time of placement and during the protection period shall be 55 F unless other requirements of ACI 306.1 are met, which may allow for a lower temperature.
4. The means used to heat a concrete mix shall be in accordance with ACI 306.1.

5. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to preventing freezing. Calcium chloride is not permitted.

B. Hot Weather:

1. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity that impairs the quality of the concrete. Hot weather concreting shall be in accordance with ACI 305.1. Concrete shall be placed in the forms without the addition of any more water than that required by the design (slump). No excess water shall be added on the concrete surface for finishing. Control of initial set of the concrete and extending the time for finishing operations may be accomplished with the use of approved water reducing and set retarding admixture, as specified.
2. Maximum time intervals between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed the following (excluding HRWR admixture use):

Concrete Temperature	Maximum time From Water Batch to Placement
Non-Agitated Concrete	
Up to 80 F	30 Minutes
Over 80 F	15 Minutes
Agitated Concrete	
Up to 75 F	90 Minutes
75 F to 89 F	60 Minutes

- a. The use of an approved set-retarding admixture will permit the extension of the above time maximums by 30 minutes, for agitated concrete only.
- b. The use of an approved high range water reducing (HRWR) or hydration-controlling admixture will allow placement time extensions as determined by the manufacturer.
3. The maximum temperature of fresh concrete at time of discharge shall not exceed 95 F. The temperatures of the mixing water shall be reduced by the use of chilled water or ice.
4. The maximum temperature of fresh concrete with high range water reducing admixture shall not exceed 100 F at time of discharge.
5. Under extreme heat, wind, or humidity conditions, concreting operations may be suspended if the quality of the concrete being placed is not acceptable.

C. Handling and Transporting:

1. Delivery tickets shall be required for each batch and shall be in accordance with ASTM C94. Each delivery ticket must show plainly the amount of water, in gallons that can be added to the mixer truck at the Site without exceeding the maximum water cement ratio approved for that mix design. Amount of water added must be in proportion to contents of truck.

2. Arrange and use chutes, troughs, or pipes as aids in placing concrete so that the ingredients of the concrete are not segregated. They shall be steel or steel lined. When steep slopes are necessary, equip the chutes with baffles or make in short lengths that reverse the direction of movement. Extend open troughs and chutes, if necessary, inside the forms or through holes left in the forms. Terminate the ends of these chutes in vertical downspouts.
3. Keep chutes, troughs, and pipes clean and free from coatings of hardened concrete by thoroughly flushing with water before and after placement. Discharge water used for flushing away from the concrete in place.
4. Concrete pumping is permitted and shall comply with ACI 304.2R.
5. Carting or wheeling concrete batches on completed concrete floor slab shall not be permitted until the slab has aged at least 4 curing days. Unless pneumatic tired carts are used, wheel the carts on timber planking so that the loads and impact are distributed over the slab. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

D. Depositing:

1. The method and manner of placing shall prevent segregation or separation of the aggregate or the displacement of the reinforcement. Use drop chutes of rubber or metal when necessary. Prevent the spattering of forms or reinforcement bars if the spattered concrete dries or hardens before it is incorporated into the mass.
2. Fill each part of the forms by directly depositing concrete as near its final position as possible. Work the coarse aggregate back from the face and force the concrete under and around the reinforcement bars without displacing them. Depositing large quantities at one point in the forms, then running or working it along the forms shall not be permitted.
3. After the concrete has taken initial set, the forms shall not be jarred. No force or load shall be placed upon projecting reinforcement.
4. Deposit the concrete through vertical drop chutes of rubber or metal of satisfactory size when operations involve placing concrete from above, such as directly into an excavated area, or through the completed forms, particularly in walls, piers, columns, and similar structures. Drop chutes shall be made in sections or provided in several lengths so that the outlet may be adjusted to proper heights during placing.
5. Concrete shall not be dropped free more than 10 feet when HRWR admixture is used or 5 feet without HRWR. Place in continuous horizontal layers with a depth of from 1 to 3 feet, depending upon the wall thickness. Each layer shall be soft when a new layer is placed upon it. No more than 1 hour shall elapse between the placing of successive concrete layers in any portion of the structures included in continuous placement.
6. Place required sections in one continuous operation to avoid additional construction joints.
7. If excessive bleeding causes water to form on the surface of the concrete in tall forms, make the mix dryer to reduce the bleeding. In tall walls, place the concrete to a point about 1 foot below the top of the wall and allow to settle for 1 to 2 hours. Resume and complete concreting before set occurs.

8. For slopes greater than two percent, start concrete placement at low end and proceed upslope.

E. Consolidating:

1. Compact each layer of concrete and flush the mortar to the surface of the forms by continuous-working mechanical vibrators. Vibrators which operate by attachment to forms shall not be used. Apply the vibrator to the concrete immediately after deposit. Move vibrator throughout the layer of the newly placed concrete, several inches into the plastic layer below. Thoroughly work the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms until it is well-compacted.
2. Mechanical vibrators shall not be operated so that they penetrate or disturb previously placed layers which are partially set or hardened. They shall not be used to aid the flow of concrete laterally. The vibration shall be of sufficient duration to completely compact and embed reinforcement and fixtures, but not to an extent causing segregation.
3. Keep vibrators constantly moving in the concrete and apply vertically at points uniformly spaced, not farther apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location longer than required to produce a liquified appearance on the surface.
4. When submerged in concrete, internal vibrators shall maintain a frequency of not less than 6000 impulses per minute for spuds with diameters greater than 5 inches and 10,000 impulses for smaller spuds. The vibration intensity (amplitude) shall be sufficient to produce satisfactory consolidation.
5. Provide one vibrator (powered pneumatically or electrically) for each 10 cubic yards of concrete per hour being placed. Provide at least one vibrator, which may be of the gasoline powered type, as a standby for each two vibrators in service. To produce satisfactory consolidation, and based upon the observed performance, the Owner's representative may require the use of a larger sized and powered vibrator.
6. Check vibrators intended for regular service or standby service before beginning concreting operations.

F. Placement in Water:

1. Deposit concrete in water only when dry conditions cannot be obtained. The forms, cofferdams, or caissons shall be sufficiently tight to prevent any water flowing through the space where concrete is to be deposited. Pumping of water shall not be permitted while the concrete is being placed, nor until it has set for at least 36 hours.
2. Carefully place the concrete compact mass using a tremie, closed bottom dumping bucket, or another approved method which does not permit the concrete to fall through the water without protection. The concrete shall not be disturbed after being deposited. Regulate depositing to maintain horizontal surfaces.
3. When a tremie is used, it shall consist of a tube constructed in sections having water-tight connections. The means of supporting the tremie shall permit the movement of the discharge end over the entire top surface of the work, and shall allow the tremie to be rapidly lowered to retard the flow. The number of times it is necessary to shift the location of the tremie shall be held to a minimum for any continuous placement of

concrete. During the placing of concrete, keep the tremie tube full to the bottom of the hopper. When a batch is dumped into the hopper, slightly raise the tremie, but not out of the concrete at the bottom, until the batch discharges to the level of the bottom of the hopper. Stop the flow by lowering the tremie. Continue placing operations until the work is completed.

4. When concrete is placed by means of the bottom dump bucket, the bucket shall have a capacity of not less than 1/2 cubic yard. Lower the bucket gradually and carefully until it rests upon the concrete already placed. Raise it very slowly during the discharge travel to maintain still water at the point of discharge and to avoid agitating the mixture.
5. Use a sump or other approved method to channel displaced fluid and concrete away from the shaft excavation. Recover slurry and dispose of it as approved. Do not discharge displaced fluids into or in close proximity to streams or other bodies of water.

G. Placement in Slabs:

1. Allow concrete in columns, walls and deep beams or girders to stand for at least 1 hour to permit full settlement from consolidation, before concrete is placed for slabs they are to support. Haunches are considered as part of the slab and shall be placed integrally with them.
2. When monolithic slabs are placed in strips, the widths of the strips, unless otherwise specified or indicated, shall insure that concrete in any one strip is not allowed to lie in place for more than 1 hour before the adjacent strips are placed.
3. Immediately before placing concrete, thoroughly dampen the earthen cushion to receive concrete to prevent moisture absorption from the concrete.
4. As soon as concrete placing is complete for a slab section of sufficient width to permit finishing operations, level the concrete, strike off, tamp and screed. The screed shall be of a design adaptable to the use intended, shall have provision for vertical adjustment and shall be sufficiently rigid to hold true to shape during use.
5. The initial strike off shall leave the concrete surface at an elevation slightly above grade so that, when consolidation and finishing operations are completed, the surface of the slab is at grade elevation.
6. Continue tamping and screeding operations until the concrete is properly consolidated and free of surface voids. Bring the surface to a smooth, true alignment using longitudinal screeding, floating, belting, and/or other methods.
7. When used, templates shall be of a design which permits early removal so satisfactory finishing at and adjacent to the template is achieved.
8. While the concrete is still plastic, straightedge the surface using a standard 10-foot metal straightedge. Lap each straightedge pass one-half of the preceding pass. Remove high spots and fill depressions with fresh concrete and re-float. Continue to check with a straightedge during the final finishing operation, until the surface is true to grade and free of depressions, high spots, voids, or rough spots.
9. Check the final surface with a straightedge. Ordinates measured from the face of the straightedge to the surface of the slab shall not exceed 1/16 inch per foot from the nearest point of contact. The maximum ordinate shall be 1/8 inch per 10 feet.

10. Unless noted otherwise, where drains are shown in slabs and sloping the slab is not indicated, slope slab to drain on a grade of 1/16 inch per foot with a maximum total slope of 1-1/4 inches. The thickness of slab at floor drain shall be the thickness of slab, as indicated on the Drawings.
- H. Placement in Foundations: Place concrete in deep foundations so that segregation of the aggregates or displacement of the reinforcement is avoided. Provide suitable chutes or vertical pipes. When footings can be placed in dry foundation pits without the use of cofferdams or caissons, forms may be omitted and the entire excavation filled with concrete to the elevation of the top of footing. The placing of concrete bases above seal courses is permitted after the forms are free from water and the seal course cleaned. Execute necessary pumping or bailing during concreting from a suitable sump located outside the forms.

3.06 FINISHING FORMED SURFACES

- A. Forms for walls, columns, and sides of beams and girders shall be removed as specified in Section 03 11 00 "Concrete Forming." Patch, repair, finish, and clean concrete after form removal. Finish concrete within 7 days of form removal. Cure concrete as finishing progresses.
- B. Air voids, for all types of finishes, are defects and shall be removed by rubbing or patching.
- C. Finish Schedule:

Type of Finish	Location
No Finish	Surfaces which are not visible from the inside or outside of the completed structure or more than 12 inches below finish grade (i.e. back of retaining walls below embankment, etc.)
Smooth Finish	Surfaces exposed to view and areas below to a point 12 inches below grade
Smooth Rubbed Finishes	Surfaces exposed to view

- D. No Finish: After forms are removed, repair or patch-tie holes and defects. Otherwise, no additional finish is required.
- E. Smooth Finish: Unless otherwise shown on the schedule above, provide smooth form finish for concrete surfaces to be exposed to view. Surfaces to receive a rubbed finish shall have a smooth form finish. The form facing material shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the facing material shall be orderly and symmetrical with a minimum number of seams. Patch tie holes and defects and remove fins flush with the adjacent surface.
- F. Smooth Rubbed Finish:
1. Rub surfaces with fluted carborundum stone rubbing at the proper time in the concrete aging process. Rubbing shall remove form marks, surface imperfections, and otherwise smooth, shape, or finish the surface. Proceed with surface rubbings when the forms are removed.

2. After form removal, perform necessary pointing. When the pointing has set sufficiently to permit rubbing, wet surfaces requiring surface finish and rub surface with a No. 16 Carborundum Stone or an abrasive of equal quality. Bring the surface to a paste, to remove all form marks and projections, and to produce a smooth dense surface without pits or irregularities.
3. Carefully spread or uniformly brush the material ground to a paste over the surface and allow to take a reset. The use of cement or plaster to form a surface shall not be permitted.
4. Prepare a 4-by-8-foot panel for the Owner's approval which shows how final finished surfaces will appear. This panel shall be used as a guide for judging the workmanship of surface finish.

G. Form Liner Finish: Finish shall be as specified in Section 03 11 00 "Concrete Forming."

3.07 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Finish slabs, platforms, and steps monolithically and apply as indicated on the Drawings and the following schedule of finishes:

Type of Finish	Location
Rough Finish	Tank floors that receive grout topping and slabs which receive additional concrete toppings.
Trowel Finish	Slab surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
Broom Finish	Exterior concrete platforms, steps, and ramps.

1. Rough Finish: Provide a rough surface by screeding only without further finish.
2. Float Finish: Finish surfaces using a float to a true, even plane with no coarse aggregate visible. In the initial floating, while the concrete is plastic, use sufficient pressure on the float to bring excess moisture to the surface for removal. Apply a final "light float" finish to the surface as the concrete hardens. The surface shall have a uniform granular texture and shall meet the straightness requirements.
3. Trowel Finish:
 - a. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

- b. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/8 inch.
- 4. Broom Finish: Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- C. Give sidewalks a brush finish, unless noted otherwise. Score sidewalks at a spacing equal to the width of the walk and edge on each side using a tool with a radius of approximately 1/4 inch.
- D. Finishing in Hot, Dry Weather: During periods of high temperature and/or low humidity, take extreme care in finishing the slabs to eliminate initial shrinkage cracks. Following the initial set of concrete, but while the concrete is still “green” continue to finish as required to remove shrinkage cracks which may occur. In hot, dry weather, keep a cement finisher on the job following normal finishing operations for a sufficient length of time to insure the removal of initial shrinkage cracks.

3.08 MISCELLANEOUS CONCRETE ITEMS

A. Normal Shrinkage Grouting:

- 1. Prior to grout application, thoroughly clean the surface of all foreign matter and wet down. Thoroughly clean the foundation and the forms set in place and securely anchor, with holes or cracks in forms caulked with rags, cotton waste or dry sand mixture to prevent the loss of grout. The necessary materials and tools shall be on hand before starting grouting operations. Concrete shall be damp when the grout is poured, but shall not have excess water to dilute the grout.
- 2. After wetting and just prior to grouting, sprinkle the surface lightly with cement to improve the bond between the grout and the surface.
- 3. After mixing, quickly and continuously place the grout to avoid overworking, segregation and breaking down of the initial set. Mix and place the grout according to the manufacturer’s recommendations. Cure grout using wet curing method for concrete. Grout shall receive a steel trowel finish.

B. Non-Shrink Grout:

- 1. Obtain field technical assistance from the Grout manufacturer, as required, to insure that grout mixing and installation comply with the manufacturer’s recommendations and procedures.
- 2. Saturate the foundation for non-shrink grouts 24 hours before installation and clear of excess water. Free baseplates or bedplates of oil, grease, laitance and other foreign substances.
- 3. Place grout according to the manufacturer’s directions so that spaces and cavities below the top of the baseplates and bedplates are completely filled. Provide forms where structural components of the baseplates or bedplates do not confine the grout. Where necessary and acceptable under the manufacturer’s procedures, a round head pencil vibrator, 3/4-inch maximum diameter may be used to consolidate the grout.

4. Steel trowel finish the non-shrink grout where the edge of the grout is exposed to view and after the grout has reached its initial set. Cut off the exposed edges of the grout at a 45-degree angle to the baseplate, bedplate, member, or piece of equipment.
5. Wet curing should occur for at least 3 days, unless specified by manufacturer, with wet rags, wet burlap or polyethylene sheets. Keep cloths constantly wet for the curing cycle.
6. Clean and dry the foundation, baseplate or other surface of epoxy grouts prior to installation. Dry curing is acceptable for epoxy grouts.
7. Use epoxy non-shrink grout under all machinery, pumps, equipment, and where chemicals are present that would abate cementitious non-shrink grouts.
8. Mix, install, cure, and finish epoxy grouts according to the manufacturer's recommendations. Install grout in recommended lifts to prevent excess heat.

3.09 CONCRETE PROTECTION AND CURING

- A. General: Give careful attention to proper concrete curing. The curing methods shall be wet curing, sheet materials conforming to ASTM C171, or membrane curing compound conforming to ASTM C309. Membrane curing is not permitted on surfaces to be rubbed or on surfaces to which additional concrete, plaster mix mortar, or terrazzo is to be applied. Unless the curing method is specified otherwise, select the appropriate curing method.
- B. Length of Curing Period:
 1. A "curing day" shall be any day on which the atmospheric temperature taken in the shade, or the air temperature adjacent to the concrete, remains above 50 F for at least 18 hours.
 2. Cure concrete for a period of 7 consecutive days. In cold weather, when curing may be retarded, extend this period to 7 "curing days", up to a limit of 14 consecutive days.
- C. Wet Curing:
 1. Immediately following the finishing operations, cover concrete slabs, including roof slabs, with wet cotton mats or with a temporary covering of canvas or burlap. Keep thoroughly wet for a period of 4 curing days after the concrete is placed. The covering shall be held in direct contact with the concrete. A temporary covering shall be required when the size of slab, size of mats, or other factors dictate that the mats cannot be placed immediately after the finishing operations without marring the finishing of the slab.
 2. Water used for curing shall be free from injurious amounts of oil, acid, alkali, salt, or other deleterious substances.
 3. Canvas or burlap covering material shall weigh not less than 12 ounces per square yard. Place the sections with a lap at the edges of at least 8 inches. Saturate cover material with water previous to placing. Keep saturated as long as it remains in place. Use care in the placing of the cover material to prevent marring the concrete surface.
 4. When temporary coverings are used, keep them in place only until the slab has sufficiently hardened so that a cotton mat covering can be substituted without marring or disturbing the slab finish. Thoroughly saturate cotton mats before placing and keep the mats on the slab in a saturated condition for a period of at least 4 curing days.

- D. Sheet Curing: Sheet materials shall conform to ASTM C171. They shall be in contact with the entire concrete surface and applied according to the manufacturer's recommendations. Patch all holes. Where pedestrian traffic is unavoidable, provide suitable walkways to protect the sheet material.
- E. Membrane Curing:
1. Membrane curing shall not be used on surfaces which receive paint, floor hardener, or plaster mix finish or other finish which would be hindered by the use of the curing compound.
 2. Cover the surface of the concrete with a continuous, uniform, water-impermeable coating, conforming to ASTM C309 "Liquid Membrane Forming Compounds for Curing Concrete" and apply according to ACI 308.1.
 3. Immediately after the removal of the side and end forms, apply a coating to the sides and ends of all concrete. Apply the solution under pressure with a spray nozzle so that the entire exposed surface is completely covered with a uniform film. The rate of application shall insure complete coverage, but the area covered shall not exceed 150 square feet per gallon of curing compound.
 4. The coating shall be sufficiently transparent and free of permanent color to not result in a pronounced color change from that of the natural concrete at the conclusion of the curing period. The coating shall, however, contain a dye of color strength to render the film distinctively visible on the concrete for a period of at least 4 hours after application.
 5. After application and under normal conditions, the curing compound shall be dry to touch within 1 hour and shall dry thoroughly and completely within 4 hours. When thoroughly dry, it shall provide a continuous flexible membrane free from cracks or pinholes and shall not disintegrate, check, peel, or crack during the required curing period.
 6. If the seal is broken during the curing period, immediately repair it with additional sealing solution.

3.10 CONCRETE SURFACE REPAIRS

- A. After the tie rods are broken back or removed, thoroughly clean the holes to remove grease and loose particles. Patch holes with structural concrete repair material. After the holes are completely filled, strike off flush excess mortar and finish the surface to render the filled hole inconspicuous.
- B. If the surface of the concrete is bulged, uneven, or shows honeycombing or form marks, which in the Engineer's opinion cannot be repaired satisfactorily, remove and replace the entire section.
- C. Patch honeycomb and minor defects in all concrete surfaces with structural concrete repair material. Cut back each defective area with a pneumatic chipping tool as deep as the defect extends, but in no case less than 1/2 inch. Prepare the existing concrete according to the recommendations of patching material manufacturer. Apply repair material according to the manufacturer's recommendations. Finish the surface of the patches to match finish on surrounding concrete.

3.11 FIELD QUALITY CONTROL

A. Testing:

1. General:
 - a. Tests shall be required throughout the Work to monitor the quality of concrete. Samples shall be taken in accordance with ASTM C172.
 - b. The Engineer may waive these requirements on concrete placements of ten cubic yards or less. However, evidence shall be furnished showing a design mix which meets the Specifications.
 - c. Unless noted otherwise, testing of the materials, ready mix, transit mix, or central plant concrete will be by an independent testing agency. The independent testing agency will be approved by the Owner and paid by the Contractor. A summary of all tests performed will be available. No concrete shall be placed without a representative present at either the plant or at the Site.
 - d. Unless the Owner's laboratory is on the Site, provide housing for the curing and storage of test specimens and equipment.
2. Slump Test: Slump tests, in accordance with ASTM C143, shall be used to indicate the workability and consistency of the concrete mix from batch to batch. Generally, a slump test shall be made at the start of operations each day, at regular intervals throughout a working day, and at any time when the appearance of the concrete suggests a change in uniformity.
3. Air Content Test: Tests for the concrete's air content shall be made in accordance with ASTM C231 or ASTM C173, at the point of delivery of concrete, prior to placing in forms. The test shall be made frequently to monitor a proper air content uniform from batch to batch.
4. Temperature Test: Test for the concrete's temperature in accordance with ASTM C1064 and as follows: the temperature of the concrete to be placed shall be taken with a thermometer immediately before placement, with the point of measurement being in the chute or bucket. Temperature test shall be performed for each truck. Record temperatures on batch ticket.
5. Compression Test:
 - a. Compression test specimens shall be 6-by-12-inch concrete cylinders made and cured in accordance with ASTM C31. If the maximum aggregate size is no larger than 1 inch, 4-by-8-inch concrete cylinders are acceptable. No fewer than two 6-by-12-inch or three 4-by-8-inch specimens shall be made for each test Sample. Samples shall be taken at a minimum of every 50 cubic yards of concrete for each class placed. At least one set of test specimens per day shall be made for each class of concrete used that day. Specimens shall be cured under laboratory conditions specified in ASTM C31. Additional concrete cylinders may be required for curing on the job under actual job curing conditions. These Samples could be required when:
 - 1). There is a possibility of the air temperature surrounding the concrete falling below 40 F, or rising above 90 F.
 - 2). The curing procedure may need to be improved and/or lengthened.

- 3). It is necessary to determine when the structure may be put into service.
 - b. Compression strength tests shall be made on the laboratory-cured and job-cured concrete cylinders at 7 and 28 days, in accordance with ASTM C39. The value of each test result shall be the average compressive strength of all of the cylinders in the test Sample. All cylinders within a test Sample shall be taken at the same time from the same batch of concrete. For the 28-day cylinders, the strength level shall be satisfactory if the averages of all sets of three consecutive strength test results exceed the required design compressive strength, and no individual strength test result falls below the required compressive strength by more than 500 psi.
6. Failure to Meet Requirements:
- a. Should the 7-day strengths shown by the test specimens fall below the required values, additional curing shall be performed on those portions of the structures represented by the test specimens at the Contractor's expense. Test cores shall be obtained and tested in accordance with ASTM Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete, Designation C 42. If additional curing does not give the strength required, the Owner reserves the right to require strengthening, replacement of those substandard portions of the structure, or additional testing, at the Contractor's expense.
 - b. Upon receipt of the Contractor's written request, substandard concrete work may be reexamined in place by nondestructive testing methods or core Samples, in accordance with ACI 301. The services of an independent testing laboratory shall be retained and all expenses paid without compensation from the Owner. Laboratory results shall be evaluated by the Engineer, who shall make the final decision on acceptability of the concrete in question. Core Sample holes shall be repaired.
- B. The Owner may withhold payment for any section of concrete which does not meet the requirements of the Specifications. Withheld payment shall be based upon the unit prices established for concrete and reinforcing steel. Payment shall be withheld until the unacceptable concrete has been refinished, removed and replaced or otherwise brought into conformance with the Specifications.

END OF SECTION

Concrete Mix Design

Project Name: _____
FNI Project Number: _____
Project Location: _____
Owner: _____
General Contractor: _____
Mix Number / Class: _____

A. Mix Design:

Cement = _____ lb/yd³
Fly Ash = _____ lb/yd³
Other Cementitious Material:
_____ = _____ lb/yd³
Fine Aggregate = _____ lb/yd³
Course Aggregate = _____ lb/yd³
Water = _____ lb/yd³
Water Reducing Admixture = _____ oz/yd³
High Range Water Reducer = _____ oz/yd³
Air Entraining Admixture = _____ oz/yd³
Other Admixture:
_____ = _____ oz/yd³
Slump = _____ inches
Gross Weight = _____ lb/yd³
Air Content = _____ percent
Water/Cement Ratio = _____

B. Materials:

	Source	ASTM	Type	Remarks
Cement				
Fly Ash				
Other Cementitious Material: _____				
Fine Aggregate				
Coarse Aggregate				
Water				
Water Reducer				
High Range Water Reducer				
Air Entraining				

	Source	ASTM	Type	Remarks
Other Admixture: _____				

C. Determination of Average Strength Required (f_{cr}'):

1. Test Records Available:

A. Summary of Test Records (Provide Supporting Documentation):

Test Group No.	No. of Consecutive Tests	Specified Strength (psi)	Standard Deviation (psi)
Average Standard Deviation:			

B. Standard Deviation Modification Factor (ACI 30 1, Table 4.2.3.3.a): ____.

C. Standard Deviation Used: ____.

D. Average Compressive Strength Required: ____.

2. Test Records Not Available:

A. Average Compressive Strength Required (ACI 30 1, Table 4.2.3.3.b, if required): ____.

D. Documentation of Required Average Compressive Strength (Check One):

1. Field Strength:

a. Field Strength Test Records (ACI 30 1, Table 4.2.3.3.a): _____. *Complete Attachment A.

2. Trial Mixtures:

a. Trial Mixtures (ACI 301, Table 4.2.3.3.b, if required): _____. *Complete Attachment B.

I, _____ certify that the above information is correct and all gradations, cement certifications, and test results are located at our place of business for review by the Engineer.

Name: _____ Date: _____

Title: _____

Company: _____

Address: _____

Attachment A

Documentation of Required Average Strength – Field Strength Records

(ACI 301, 4.2.3.4.a)

A. Summary of Test Records (Provide Supporting Documentation):

Test Record No.	No. of Tests in Record	Duration of Record (days)	Water-Cementitious Materials Ratio	Average Strength (psi)

B. Interpolation used? _____.

1. Provide an interpolation calculation or plot of strength versus proportions.

C. Submit the following data for each mix:

1. Brand, type, and amount of cement.
2. Brand, type, and amount of each admixture.
3. Source of each material used.
4. Amount of water.
5. Proportions of each aggregate material per cubic yard.
6. Gross weight per cubic yard.
7. Measured slump.
8. Measured air content.
9. Results of consecutive strength tests.

Attachment B

Documentation of Required Average Strength – Trial Mixtures (ACI 301, 4.2.3.4.b)

A. Summary of Test Record(s):

Trial Mix No.	7-Day Tests		28-Day Tests		Water-Cementitious Materials Ratio	Slump (in)	Air Content (percent)	Temperature (F)
	No. of Test Cylinders	Strength (psi)	No. of Test Cylinders	Strength (psi)				

B. Maximum water-cementitious materials ratio _____.

1. Provide an interpolation calculation or plot of strength versus water-cementitious materials ratio.

C. Submit the following data for each mix:

1. Brand, type, and amount of cement.
2. Brand, type, and amount of each admixture.
3. Amount of water used in trial mixes.
4. Proportions of each aggregate material per cubic yard.
5. Gross weight per cubic yard.
6. Measured slump.
7. Measured air content.
8. Compressive strength developed at 7 days and 28 days, from not less than three test cylinders cast for each 7-day and 28-day test.

END OF ATTACHMENTS

05 50 00 METAL FABRICATIONS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Metal ladders.
 - 4. Metal floor plate and supports.
 - 5. Miscellaneous steel trim.
 - 6. Metal bollards.
 - 7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Sections:
 - 1. Section 03 30 00 "Cast-In-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 05 53 00 "Metal Gratings."

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 F, ambient; 180 F, material surfaces.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 1. Paint products.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code - Steel."
 2. AWS D1.2, "Structural Welding Code - Aluminum."
 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

2.00 PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Stainless-Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 316L.
- C. Stainless-Steel Bars and Shapes: ASTM A276, Type 316L.
- D. Steel Tubing: ASTM A500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A53, standard weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches or as required to comply with structural performance requirements.
 - 2. Material: Galvanized steel, ASTM A653, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.03 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.

2.04 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- B. Shop Primers: Provide primers that comply with Section 09 96 00.01 "High-Performance Coatings."
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- E. Anti-Seize Lubricant: Loctite LB 8023 Marine Grade Anti-Seize lubricant or approved equal.

2.06 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with primer specified in Section 09 96 00.01 "High-Performance Coatings" where indicated.

2.08 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3 unless otherwise indicated.
- B. Aluminum Ladders:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACL Industries, Inc.
 - b. Alco-Lite Industrial Products.
 - c. Halliday Products.
 - d. O'Keeffe's Inc.
 - e. Precision Ladders, LLC.
 - f. Royalite Manufacturing, Inc.
 - g. Thompson Fabricating, LLC.
 - 2. Space siderails 18 inches apart unless otherwise indicated.
 - 3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
 - 4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
 - 5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
 - 6. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 3/4 inch in least dimension.

7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.

2.09 METAL FLOOR PLATE

- A. Fabricate from rolled-aluminum-alloy tread plate of thickness indicated below:
 1. Thickness: 3/8 inch or as indicated.
- B. Provide aluminum angle supports as indicated.
- C. Include aluminum angle stiffeners, and fixed and removable sections as indicated.
- D. Provide flush aluminum bar drop handles for lifting removable sections, one at each end of each section.

2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Prime miscellaneous steel trim with primer specified in Section 09 96 00.01 "High-Performance Coatings."

2.11 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe.
- B. Fabricate bollards with 3/4-inch thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Galvanize and paint bollards.

2.12 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Prime plates with primer specified in Section 09 96 00.01 "High-Performance Coatings."

2.13 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with zinc-rich primer or primers specified in Section 09 96 00.01 "High-Performance Coatings" as indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Dull Satin Finish: No. 6.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.17 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.
- G. Anti-Seize Lubricant: Where stainless steel nuts and bolts will be installed, apply anti-seize lubricant to threads as recommended by lubricant manufacturer to prevent seizure of nut and bolt during installation or upon removal at a future date.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.03 INSTALLING METAL BOLLARDS

- A. Anchor bollards to existing construction with adhesive anchor bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete, unless indicated otherwise.
- B. Anchor bollards in place with concrete footings. Center and align bollards in holes three inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.

3.04 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use non-shrink, non-metallic grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections. The independent testing agency will be approved by the Owner and paid by the Contractor.
- B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- C. Welded Connections: Field welds will be 100 percent visually inspected according to AWS D1.1.
 - 1. Full penetration welds and other welds as specified: In addition to 100 percent visual inspection, 10 percent of connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
 - 1. Corrective measures shall be taken when welding is unsatisfactory or indicates inferior workmanship. Chip and grind if the removal of part of the weld or a portion of the base

metal is required. Where deposition of additional weld material is necessary, the sides of the area to be welded shall have no less than one to one (1:1) slope to allow room for depositing new material. Correct defective or unsound welds by the removal and replacement of the entire weld using the following procedures:

- a. Excessive Convexity: Reduce to size by removal of excess weld metal by grinding.
 - b. Shrinkage Cracks, Cracks in Base Metal, Craters and Excessive Porosity: Remove defective portions of base and weld material down to sound metal, and deposit additional sound material.
 - c. Undercutting, Undersize, and Excessive Concavity: Clean and deposit additional weld metal.
 - d. Overlapping and Incomplete Fusion: Remove and replace the defective portion of the weld.
 - e. Slag Inclusion: Remove those parts of the welds containing slag. Fill with sound weld metal.
 - f. Removal of Adjacent Base Metal during Welding: Clean and form full size by depositing weld material.
2. Remove cracked welds throughout their length.
 3. Where work performed subsequently to the making of the deficient weld has rendered the weld inaccessible, or has caused new conditions which make connection of the deficiency dangerous or ineffectual, restore the original conditions by removing welds or members, or both before making the necessary corrections. Another option is to compensate for the deficiency with additional work according to the revised design, approved by the Engineer.
 4. Cut apart and reweld improperly fitted and misaligned parts.
 5. Straighten members distorted by heat of welding using mechanical means or by carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200 degrees Fahrenheit as measured by Tempilsticks. Parts to be heated for straightening shall be free from external stress forces, except when mechanical means are used in conjunction with heat application.
 6. If faulty welding or its removal for rewelding damages the base metal so that, in the Engineer's judgment, it is not in accordance with the intent of the Contract Documents, remove and replace the damaged material and compensate for the deficiency in a manner acceptable to the Engineer.
 7. Maximum space between pieces or members for fillet welds shall be 1/16 inch. Only effective portion shall be considered in measuring fillet welds.

3.06 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 96 00.01 "High-Performance Coatings."

- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

05 53 00 METAL GRATINGS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal bar gratings.
 - 2. Glass-fiber-reinforced plastic gratings.
 - 3. Metal frames and supports for gratings.
- B. Related Sections:
 - 1. Section 05 50 00 "Metal Fabrications" for grating support framing system components.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Floors and Elevated Landings : Uniform load of 100 lbf/sq. ft. or concentrated load of 1500 lbf, whichever produces the greater stress.
 - 2. Limit deflection to L/240 or 1/4 inch, whichever is less.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Glass-fiber-reinforced plastic gratings.
 - 2. Clips and anchorage devices for gratings.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2, "Structural Welding Code - Aluminum."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

2.00 PRODUCTS

2.01 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer for type of use indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Shapes: ASTM B221, alloys as follows:
 - 1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
 - 2. 6061-T1, for grating crossbars.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 2.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 - 1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.03 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.04 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

2.05 METAL BAR GRATINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alabama Metal Industries Corporation; a Gibraltar Industries company.
 - 2. All American Grating.
 - 3. BarnettBates Corporation.
 - 4. Borden Metal Products (Canada) Limited.
 - 5. Fisher & Ludlow; Division of Harris Steel Limited.
 - 6. Grating Pacific, Inc.
 - 7. Grupo Metelmex, S.A. de C.V.
 - 8. IKG Industries; a division of Harsco Corporation.
 - 9. Marwas Steel Co.; Laurel Steel Products Division.
 - 10. Ohio Gratings, Inc.

11. Seidelhuber Metal Products; Division of Brodhead Steel Products.
- B. Pressure-Locked, Rectangular Bar Aluminum Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
1. Bearing Bar Spacing: 1-3/16 inches o.c.
 2. Bearing Bar Depth: 1-1/2 inches or as required to comply with structural performance requirements.
 3. Bearing Bar Thickness: 1/8 inch or as required to comply with structural performance requirements.
 4. Crossbar Spacing: 4 inches o.c.
 5. Traffic Surface: Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive unless indicated otherwise.
 6. Aluminum Finish: Mill finish.
- C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
1. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
 2. Furnish threaded bolts with nuts and washers for securing grating to supports.
 3. Furnish self-drilling fasteners with washers for securing grating to supports.
 4. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1). Kee Industrial Products, Inc.; Grating Clip.
 - 2). Lindapter North America, Inc.; Grate-Fast.
- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- E. Do not notch bearing bars at supports to maintain elevation.

2.06 GLASS-FIBER-REINFORCED PLASTIC GRATINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Grating, LLC.
 2. Creative Pultrusions, Inc.
 3. Enduro Systems Inc.; Composite Products Division.

4. Fibergrate Composite Structures Inc.
 5. Fisher & Ludlow; Division of Harris Steel Limited.
 6. Grating Pacific, Inc.
 7. Seasafe, Inc.; a Gibraltar Industries company.
 8. Strongwell Corporation.
- B. Molded Glass-Fiber-Reinforced Gratings: Bar gratings made by placing glass-fiber strands that have been saturated with thermosetting plastic resin in molds in alternating directions to form interlocking bars without voids and with a high resin content.
1. Configuration: 1-1/2-inch square mesh, thickness as required to comply with structural performance requirements.
 2. Resin: Vinylester.
 - a. Flame-Spread Index: 25 or less when tested according to ASTM E84.
 3. Color: Manufacturer's standard.
 4. Traffic Surface: Applied abrasive finish unless indicated otherwise.
- C. Pultruded Glass-Fiber-Reinforced Gratings: Bar gratings assembled from components made by simultaneously pulling glass fibers and extruding thermosetting plastic resin through a heated die under pressure to produce a product without voids and with a high glass-fiber content.
1. Configuration: I6015; 1-1/2-inch I-bars spaced 1-1/2 inches o.c. (60 percent open) or as required to comply with structural performance requirements.
 2. Resin Type: Vinylester.
 - a. Flame-Spread Index: 25 or less when tested according to ASTM E84.
 3. Color: Manufacturer's standard.
 4. Traffic Surface: Applied abrasive finish unless indicated otherwise.
- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.07 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

- B. Frames and Supports for Glass-Fiber-Reinforced Plastic Gratings: Fabricate from glass-fiber-reinforced plastic shapes of sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
 - 1. Unless otherwise indicated, use shapes made from same resin as gratings.
 - 2. Equip units indicated to be cast into concrete or built into masonry with integral anchors.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.02 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 INSTALLING GLASS-FIBER-REINFORCED PLASTIC GRATINGS

- A. Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

END OF SECTION

09 96 00.01 HIGH-PERFORMANCE COATINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to apply protective coatings to material and equipment as specified herein, including the preparation of surfaces prior to application of coatings.
- B. Protective coatings are special coatings to be used at specific locations or on specific surfaces as indicated herein. Every surface of every description, except those which are specifically noted not to receive a coating finish, must be covered by a paint system as specified in this Section.
- C. Protective coatings must be applied to the following surfaces:
 - 1. Metal surfaces located outside of buildings and other structures anywhere on the Site.
 - 2. Concrete surfaces at the following locations:
 - a. Interior of new concrete bays at Bulk Chemical Storage Area
 - b. Interior of existing concrete bays at Bulk Chemical Storage Area
 - 1). Existing piping and conduits mounted to the interior walls of the concrete bays shall remain in place.
- D. The following must not be coated and must be protected from drips, overspray, etc. unless indicated otherwise
 - 1. Stainless steel piping, materials and equipment
 - 2. Galvanized steel piping, materials and equipment unless specifically indicated to be coated.
 - 3. Aluminum materials and equipment
 - 4. Interior electrical items
- E. Contain, treat, and dispose of any dust, spray, drainage, or spillage resulting from coating operations. It is the Contractor's responsibility to determine if the materials to be disposed of are classified as Hazardous Waste. Disposed of waste, hazardous or otherwise, must be in accordance with applicable regulations. Contractor must be aware of and understand the regulations concerning disposal of waste generated by coating operations.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Products which comply with the Contract Documents and are manufactured by the following companies will be acceptable:
 - 1. Tnemec Company, Inc.
 - 2. Carboline.
 - 3. PPG Protective & Marine Coatings.
 - 4. The Sherwin-Williams Company.

5. Akzo Nobel / International Paint, LLC.
6. ICI Devoe High Performance Coatings.
7. Plasite Protective Coatings.

It is desired that the paint products be furnished by as few manufacturers as possible to meet the requirements of the Specifications. Coating products of the same type must be supplied by the same manufacturer. Do not mix products from different sources.

- B. **Applicator's Qualifications:** Applicators must be qualified in this line of work and have a minimum of 5 years of experience in the application of the protective coatings of the types specified herein. Submit a list of recent projects and names of references for those projects.
- C. **Product Quality:**
 1. Use only the coatings specified in this Section. Use only those thinners and solvents recommended by the manufacturer, only in the amounts necessary to produce the manufacturer's recommended spreading rate, and in amounts not exceeding the maximum quantities stated in the manufacturer's literature.
 2. The coating material must not show excessive settling in a freshly opened full can and must be easily re-dispersed with a paddle to a smooth, homogeneous state. It must show no curdling, livering, caking, or color separation and must be free of lumps or skim surfaces.
- D. **Inspection:**
 1. Inspect and provide substrate surfaces prepared in accordance with the Contract Documents and the printed directions and recommendations of paint manufacturer whose product is to be applied.
 2. Provide Engineer minimum 3 days' notice prior to start of surface preparation work or coating application work.
 3. Perform Work only in the presence of Engineer, unless Engineer grants prior approval to perform such Work in Engineer's absence. Approval to perform Work in the Engineer's absence is limited to the current day unless specifically noted to extend beyond the completion of the work day.
 4. Inspection by the Engineer, or the waiver of inspection of any particular portion of the Work, must not be construed to relieve the Contractor of responsibility to perform the Work in accordance with the Contract Documents.
 5. Contractor is solely responsible for testing for this Section, at no further cost to the Owner. Engineer may also make such tests if it is considered necessary. Cooperate with the Engineer, providing equipment, scaffolds, and other equipment as requested by the Engineer.
- E. **Testing Equipment:** Furnish the testing apparatus necessary for testing coatings, including the following:
 1. One set of U.S. Department of Commerce thickness calibration plates, certified by the National Bureau of Standards, to test dry film thickness.
 2. Wet-film thickness gauges. Give one to Owner's representative. Each painter must keep one to test paint as it is applied.

3. One electronic dry-film thickness gauge capable of measuring 0-200 mils with calibration standards approved by the Bureau of Standards.
 4. One Elcometer 319 Dewpoint Meter or approved equal.
 5. One Tinker and Razor Model M 1 Holiday Detector and recommended wetting agent and/or High Voltage Holiday Detector if required for coating thickness specified.
 6. One set of SSPC-VIS 1, 3 and 4 - Visual Standards as applicable.
- F. Testing Reports: Submit an inspection report for each coating applied on the Project. The testing report must be completed on a form furnished by the Engineer and must bear the signature of the Contractor and the Owner's representative.

1.03 SUBMITTALS

- A. Submittals must be in accordance with Section 01 33 00 "Document Management."
- B. The following Product Data for products, including manufacturer's data sheets, are due prior to ordering coating and surface preparation materials:
1. Coating manufacturer's color selection literature for coating materials and caulk.
 2. Sample warranty document for products.
 3. Provide certification from the manufacturer that all coatings will not contain more than 0.06 percent by weight of lead in the cured coating for each coat applied.
 4. Coating manufacturer's Product Information and Safety Data Sheets (SDS) for each coating and caulk material. Product Information must include the following:
 - a. The manufacturer's published instructions for use in specifying and applying all proposed coatings.
 - b. Application instructions written and published by the coating manufacturer.
 - c. All limitations, precautions and requirements that may adversely affect the coating, that may cause unsatisfactory results after the application or that may cause the coating not to serve the purpose for which it was intended, must be clearly and completely stated in the instructions. Limitations and requirements must include, but are not necessarily limited to the following:
 - 1). Surface preparation.
 - 2). Method(s) of application.
 - 3). Thickness of each coat (maximum and minimum DFT).
 - 4). Drying and curing time of each coat.
 - 5). Time (minimum and maximum) allowed between coats.
 - 6). Thinner and use of thinner.
 - 7). Proper mixing of coating before application.
 - 8). Weather limitations during and after application (temperature and humidity, time weighted).
 - 9). Physical properties of coating, including percent solids content by volume.

- 10). Equipment settings (air cap, fluid tip, equipment pressure settings, etc.).
 - 11). Pot life at various temperature and humidity conditions.
 - 12). Provide documentation that interior coating system is compatible with the cathodic protection system.
- C. The following samples are required prior to ordering the materials:
1. Three samples of selected exterior finish colors for approval on 6-inch by 6-inch swatches. Label each swatch with the manufacturer's name, coating name/type, color name and number.
- D. The following Product Data is required prior to coating work:
1. Coating Plan:
 - a. Anticipated coating process schedule by date, including dates when hold-point inspections are anticipated. Schedule must indicate detailed activities on a daily basis.
 - b. Detailed procedures and schedule for all pre-cleaning, surface preparation and application of coating, including touch-up and repair procedures for all coating systems.
 - c. Recoat schedule on the submitted coating materials.
 - d. Data sheets complete with a graduated scale or curve, produced by the coating manufacturer, with curing characteristics and recommendations regarding complete coating curing. The data sheets and scales or curves must include specific cure times over a wide range of temperatures and humidity.
 - e. Provide a written plan documenting how spent cleaning debris and/or paint over spray or droplets will be contained/confined to the Site and tank site during the surface preparation and coating application operations. Reasonable care must be exercised by the Contractor to prevent damage, nuisance, or hazardous conditions to adjacent or nearby property Owners. Include all materials and method to be used for protection of exterior surfaces, and allow for recovery and disposal of paint scraps and blast media.
 2. Provide documentation on proposed containment system methods for blasting and coating operations.
 3. Contractor must submit evidence of notification of the appropriate office of the Texas Commission on Environmental Quality (TCEQ) prior to abrasive blasting as required. Submit copies of any obtained permits.
 4. Coating Manifest - Within 48 hours of coating delivery to the Site, Contractor must record the batch number stamped on each coating container and submit a typed list to the Owner's representative. Minimum information required is listed below.
 - a. Date of delivery to the Site.
 - b. Name and signature of superintendent recording the data.
 - c. List of batch number including corresponding coating identification, color, date of manufacture and volume of each container.

- E. The following Certified Test Report(s) are required prior to coating work:
1. SDS sheets for all abrasive to be used on the Project.
 2. Certification and laboratory test results indicating recycled metallic abrasive per SSPC-AB 2 or 4 and atomic absorption test results.

1.04 STANDARDS

- A. The applicable provisions of the following standards apply as if written here in their entirety. Adhere to the latest standards and codes published by the following organizations.
- B. In the event of a conflict between the published standards, codes, and this Section, the more stringent requirement govern as interpreted by the Engineer.

1. NSF International (NSF) / American National Standards Institute (ANSI):

NSF/ANSI Standard 61	Drinking Water Components
----------------------	---------------------------

2. ASTM International (ASTM):

ASTM D523	Standard Test Method for Specular Gloss
ASTM D610	Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4285	Standard Test Method of Indicating Oil and Water in Compressed Air
ASTM D417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester
ASTM D4787	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
ASTM D5162	Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
ASTM D6386	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Pull-Off Adhesion Testers
ASTM E337	Standard Practice Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

3. AWWA (American Water Works Association):

AWWA C210	Liquid-Epoxy Coating and Linings for Steel Water Pipelines
AWWA C222	Polyurethane Coatings and Linings for Steel Water Pipe and Fittings

4. Consumer Product Safety Act, Part 1303.

5. International Concrete Repair Institute (ICRI):

ICRI Technical Guideline No. 03732	Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers and Polymer Overlays
------------------------------------	--

6. NACE International (National Association of Corrosion Engineers):

NACE TPC2	Coating and Lining for Immersion Service: Chapter Safety, Chapter 2 Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
NACE SP0178	Design Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service
NACE SP0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE SP0178	Surface Finishing of Welds Prior to Coating; Weld Replica Only to be used with NACE SP0178
NACE RP0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape

7. National Association of Pipe Fabricators (NAPF):

NAPF 500-03	Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
-------------	--

8. OSHA (Occupational Safety & Health Administration):

29 CFR 1915.35	Painting
29 CFR 1926.62	Lead

9. The Society for Protective Coatings (SSPC):

SSPC-VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC-VIS 3	Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand Tool Cleaning
SSPC Vol. 1	Good Painting Practices
SSPC-AB 1	Mineral and Slag Abrasives
SSPC-AB 2	Cleanliness of Recycled Ferrous Metallic Abrasives
SSPC-AB 3	Ferrous Metallic Abrasives
SSPC-AB 4	Recyclable Encapsulated Abrasive Media in a Compressible Matrix
SSPC-SP 1	Solvent Cleaning
SSPC-SP 2	Hand Tool Cleaning
SSPC-SP 3	Power Tool Cleaning
SSPC-SP 11	Bare Metal Power Tool Cleaning

SSPC-PA 1	Shop, Field and Maintenance Painting of Steel
SSPC-PA 2	Determining Compliance to Required DFT
SSPC-PA 10	Guide to Safety and Health Requirements for Industrial Painting Projects
SSPC-PA 17	Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
SSPC Guide 6 (CON)	Containment of Debris
SSPC Guide 12	Illumination of Painting Projects
SSPC Guide 15	Retrieval and Analysis of Soluble Salts

10. SSPC/NACE International Joint Standards:

SSPC-SP 5/NACE 1	White Metal Blast Cleaning
SSPC-SP 6/NACE 3	Commercial Blast Cleaning
SSPC-SP 7/NACE 4	Brush - Off Blast Cleaning
SSPC-SP 10/NACE 2	Near - White Metal Blast Cleaning
SSPC-SP 13/NACE 6	Surface Preparation of Concrete

11. Texas Commission on Environmental Quality (TCEQ):

30 TAC Chapter 290, Subchapter D	Rules and Regulations for Public Water Systems
----------------------------------	--

1.05 DELIVERY AND STORAGE

- A. Deliver coating products to the Site in original unopened containers, with manufacturer's label and batch number attached. Do not apply products until the Owner's field representative has approved the product for use.
- B. Use one location at each site for the storage of coating products. Protect the floor from spills and other damage. Protect the products from extreme heat or cold. Keep containers covered. Keep the storage rooms clean of trash and debris. Dispose of oily or used rags daily. Under no circumstances will they be allowed to accumulate. Take precautions to prevent fires. The storage of flammable liquids must comply with the City, State, or other fire codes.
- C. Storage of coatings and other products must be in accordance with the manufacturer's requirements. Coatings that have been damaged or not stored properly must not be applied and must be removed from the Site.
- D. All products and coatings that are not approved for the Project must be removed from the Site and must not be stored at the Site.
- E. All materials must be delivered to the Site in original sealed containers with the date of manufacture and batch number stamped thereon by the coating manufacturer. Materials are subject to random observations by the Owner's representative at the Site.

1.06 ENVIRONMENTAL CONDITIONS

- A. Do not apply coatings under conditions that are unsuitable for the production of good results. Remove trash and debris from enclosed buildings and thoroughly clean prior to application of coatings. Do not begin application of coatings in areas where other trades are

working, or where construction activities result in airborne dust or other debris. Do not apply coatings in conditions which do not conform to the recommendations of the coatings manufacturer.

- B. Coatings must only be applied when conditions fall within the parameters listed in the manufacturer's printed data.
- C. Contractor must provide dehumidification equipment sized to maintain dew point temperature 5 deg. F or more below surface temperature of metal surfaces to be cleaned and painted.
- D. Do not apply any coatings when weather conditions are unfavorable. In the event that climatic conditions are not conducive for best results, postpone application of coatings until conditions conform to the manufacturer's recommendations and the provisions of this Section.
- E. Do not apply coatings to a wet or damp surface in wet or damp weather conditions, or when there is dust in the air. Surfaces exposed to direct sunlight must be shaded by awnings or other protective devices while coatings are being applied, if recommended by coating manufacturer. When necessary, provide temporary heating devices of a type that produces no fumes which will discolor the paint system.
- F. Heating and Dehumidification:
 - 1. Dehumidification equipment must be used to control the environment during surface preparation, rehabilitation, coating application and coating curing at no additional cost to the Owner, if acceptable environmental conditions cannot be met.

If the Contractor cannot meet the required environmental conditions to apply the interior coating system per this Section and the coating manufacturer's written recommendations, Contractor will cease operations until approved dehumidification equipment has been provided and acceptable environmental conditions are achieved.

If coating system is applied without dehumidification or in conditions not acceptable by this Section and by the coating manufacturer's written requirements, Contractor must fully remove coating system applied and replace per the Engineer's direction.
 - 2. The Contractor must furnish all labor, materials, equipment, fabrication and quality control inspections, and all other incidentals required to control and maintain the environment of the reservoir within the parameters stated in this Section and must incorporate these and any other expenses into its bid.
 - 3. The Owner reserves the rights, in the event the dehumidification equipment is not performing to the minimum requirements stated in this Section, to require the Contractor to modify and or add additional equipment to satisfy the conditions of this Section, at the sole cost to the Contractor.
 - 4. It is the Contractor's responsibility to provide adequate dehumidification equipment to meet the requirements of this Section and coating manufacturer's requirements. The coating manufacturer's limits of surface temperature, tank inside air temperature and relative humidity requirements will govern, if more stringent than the requirements stated within this Section.

G. Forced Ventilation:

1. Provide continuous forced fresh air ventilation when working inside of containment systems or enclosed areas that are not openly vented from the beginning of surface preparation through final coating operations and coating curing.
2. Forced ventilation must be supplied per the recoat time required by the coating manufacturer and at least 48 hours after the final coat has been applied.
3. From the beginning of interior wet and/or dry coating application and until this coating is cured, the Contractor must monitor the air for the lower explosion limit (LEL) as published in the coating manufacturer's product SDS's.
4. Contractor is responsible for supplying, installing and maintaining the forced ventilation system.

H. Containment System:

1. Contractor must provide containment methods, either full or partial, which allows for the containment of the environmentally sensitive waste, dust and paint over spray that will be generated during the abrasive blasting and painting operation.
2. Minimum Containment for Field Surface Preparation:
 - a. Provide a minimum SSPC Guide 6 (CON) Class 3A.D1.E3 containment system when dry abrasive blasting.
 - b. Provide a minimum SSPC Guide 6 (CON) Class 2W containment system when wet abrasive blasting. All water must be contained and properly disposed of.
 - c. Provide a minimum SSPC Guide 6 (CON) Class 2P.E3 containment system when power tool cleaning.
3. The ground surrounding the project area must be protected from all debris, emissions, dust, and other materials generated in the cleaning operations with a minimum of two layers of polyethylene covered with plywood or the same material used for the perimeter containment system.
4. Containment is not required when blasting on the interior of a completely enclosed area (i.e. roof is in place) as long as no visible emissions are created.
5. The Contractor must ensure that no spent cleaning/blasting debris, dust, overspray, coating droplets, or emissions of any kind, escape to the atmosphere, or to adjacent buildings, private property, work sites, parking lots, etc.
6. The Owner reserves the right to stop Work or require containment, additional containment or different containment methods if the Contractor's operations create a nuisance beyond the tank site property line in the sole opinion of the Owner, the Engineer, the Owner's representative, any regulatory agency, or neighbor. All costs of providing an adequate containment system must be included by the Contractor in the Base Bid.
7. The Contractor must be responsible for all materials that are used and for any apparatus used to contain dust emissions, debris, overspray, and coating droplets. The containment system attachments to existing or proposed structures must be designed not to impose excessive loading on the structure by a professional engineer licensed in

the state the Project is located. Contractor must submit the P.E. designed and sealed details of the containment system on the tank.

Any damage to the structure(s) as a direct or indirect result of the containment system must be repaired or sections replaced by the Contractor at no additional cost to the Owner. Neither the Owner nor the Owner's Engineer assumes any responsibility for the structural ability of the structure to support the containment system.

8. If tarps are used as part of the containment system, the tarps must be an impervious, solid, flame-resistant material, reinforced with a fiber mesh and must allow as much light as possible to pass through the material.

I. Visible Emissions:

1. Contractor must control visible emissions and releases while dust producing activities are underway.
2. Visible emissions more than SSPC Guide 6, Level 1 (1 percent of the workday or 5 minutes in an 8-hour shift) are unacceptable. Sustained emissions of more than 1 minute, regardless of the total time of emissions for the day is unacceptable. If unacceptable emissions are observed, Contractor must shut down immediately and correct the situation and clean up any debris generated from the release to the satisfaction of the Engineer before continuing the Work.

1.07 WORKING CONDITIONS

- A. Provide adequate lighting at any location that coatings are being applied or testing is performed. Illumination must be of sufficient intensity to achieve good results. Provide explosion-proof lighting when required.
- B. Temporary ladders and scaffolds must conform to applicable safety requirements. Erect temporary scaffolds where needed to cover large areas. Provide ladders or scaffolding during testing procedures.

1.08 WARRANTY/GUARANTEE

- A. Protective coating must be guaranteed for a period of 1 year from the date of the Owner's acceptance of the Project.
- B. A warranty inspection must be conducted prior to the end of the warranty period. Any Defective Work discovered at this date must be corrected by the Contractor in accordance with the Contract Documents at no additional cost to the Owner.

2.00 PRODUCTS

2.01 GENERAL COATING REQUIREMENTS

- A. All coatings must be free of heavy metals such as arsenic, barium, chromium, selenium, silver, lead, mercury and cadmium.
- B. All coatings in contact with potable water must be certified by the NSF Standard 61.
- C. Coatings submitted or used on this Project must not have a VOC (volatile organic content) in excess of 360 grams per liter or 3 lb. per gal.

D. Finish coatings must be from the same batch.

2.02 MATERIALS

A. Coating products are to be as follows:

Type A - Alkyd-Phenolic Universal Primer	
Manufacturer	Approved Coating
Tnemec	Series 1 Purple Prime
Sherwin-Williams	Kem Kromik Universal
Akzo Nobel / International Paint, LLC	Interlac 573
Devoe Coatings	Devprime 1403
Carboline	Carbocoat 150UP
PPG	Multiprime 4360

Type B - Epoxy-Polyamide Primer	
Manufacturer	Approved Coating
Tnemec	Series 66
Sherwin-Williams	Copoxy Primer
Akzo Nobel / International Paint, LLC	Intergard 251; Intergard 269 for valves and gates, submerged structural steel and misc. metals, and submerged piping
Devoe Coatings	Devran 201V Series
Carboline	890
PPG	Amercoat 385

Type C - Penetrating Epoxy Pre-Primer	
Manufacturer	Approved Coating
Tnemec	Approved Equal
Sherwin-Williams	Macropoxy 920 Pre-Prime
Akzo Nobel / International Paint, LLC	Interbond 600
Devoe Coatings	Approved Equal
Carboline	Rustbond Penetrating Sealer
PPG	Amerlock Sealer

Type D - Inorganic Zinc Primer (Minimum 80% Zinc by Weight)	
Manufacturer	Approved Coating
Carboline	Carbozinc 12 VOC
Sherwin-Williams	Zinc Clad II Plus

Type D - Inorganic Zinc Primer (Minimum 80% Zinc by Weight)	
Manufacturer	Approved Coating
PPG	Dimetcote 9 VOC
Approved Manufacturer	Approved Equal

Type E - Organic Zinc Primer (Minimum 80% Zinc by Weight)	
Manufacturer	Approved Coating
Carboline	Carbozinc 859
Sherwin-Williams	Corothane I Galvapac
PPG	Amercoat 68HS
Akzo Nobel / International Paint, LLC	Interzinc 52
Approved Manufacturer	Approved Equal

Type F - Alkyd Enamel	
Manufacturer	Approved Coating
Tnemec	Series 23 Enduratone
Sherwin-Williams	DTM Alkyd Enamel
Akzo Nobel / International Paint, LLC	Interlac 665
Devoe Coatings	Devlac 1431
Carboline	Carbocoat 8225
PPG	Fast Dry 35

Type G - Epoxy-Polyamide Coatings	
Manufacturer	Approved Coating
Tnemec	Series 66
Sherwin-Williams	Macropoxy 646 Epoxy
Akzo Nobel / International Paint, LLC	Intergurd 475HS; Interseal 670HS for valves and gates, PVC pipe and conduit, submerged structural steel and misc. metals, and submerged piping
Devoe Coatings	Bar-Rust 235
Carboline	Carboguard 60
PPG	Amerlock 385

Type H - Epoxy-Polyamide Coatings for Potable Water (NSF 61 Certified)	
Manufacturer	Approved Coating
Tnemec	Series N140 Pota-Pox Plus
Sherwin-Williams	Tank Clad Epoxy
Akzo Nobel / International Paint, LLC	Interline 850 or Interseal 670HS (NSF colors)
Devoe Coatings	Bar-Rust 233H Series
Carboline	Carboguard 61
PPG	Amerlock 2/400

Type I - Aliphatic Polyurethane Enamel	
Manufacturer	Approved Coating
Tnemec	Series 1074 Endura-Shield II
Sherwin-Williams	Hi-Solids Polyurethane
Akzo Nobel / International Paint, LLC	Interthane 990 Series
Devoe Coatings	Devthane 379 Series
Carboline	Carbothane 133HB (Satin) or Carbothane 134HG (High Gloss)
PPG	Pitthane Ultra Series

Type J - Silicone Aluminum Coatings For High Temperature	
Manufacturer	Approved Coating
Tnemec	Series 39 Silicon Aluminum
Sherwin-Williams	Silver Brite Aluminum B59S8
Akzo Nobel / International Paint, LLC	Intertherm 50 Series
Devoe Coatings	Intertherm 50 Series
PPG	Hi-Temp 500
Carboline	Carbozinc 11; Finish: Thermaline 4700 Series (up to 1000 deg. F); Thermaline 4900 (up to 450 deg. F)

Type K- Epoxy Concrete Coating	
Manufacturer	Approved Coating
Tnemec	Series 64H-413 Hi-Build Tneme-Tar
Sherwin-Williams	Tar Guard Epoxy
Akzo Nobel / International Paint, LLC	Interzone 954
Devoe Coatings	Devtar 5A Series

Type K- Epoxy Concrete Coating	
Manufacturer	Approved Coating
PPG	Amercoat 78HB Coal Tar Epoxy
Carboline	Bitumastic 300M

Type L - Epoxy Concrete Coating - High Friction Surface (HFS)	
Manufacturer	Approved Coating
Tnemec	Series 434/435 Perma-Shield System
Akzo Nobel / International Paint, LLC	Ceilmate 380/242GF Flakeline System
PPG	SFT 675
Carboline	Carboguard 510 Series / Plasite 4500 Series

Type M - High Solids Epoxy Siloxane	
Manufacturer	Approved Coating
Carboline	Carboxane 2000
Sherwin-Williams	Polysiloxane XLE-80
PPG	PSX 700 Polysiloxane
Approved Manufacturer	Approved Equal

Type N - Epoxy Mastic	
Manufacturer	Approved Coating
Carboline	Carbomastic 15
Sherwin-Williams	Epoxy Mastic II
PPG	Amerlock 2/400 AL
Tnemec	Chembuild Series 135
AkzoNobel/International Paint, LLC	Interseal 670HS

Type O - Elastomeric Polyurethane Hybrid	
Manufacturer	Approved Coating
Carboline	Reactamine 760 Series
Sherwin-Williams	Sherflex S
PPG	Amerthane 490
Tnemec	Elasto-Shield Series 406
AkzoNobel/International Paint, LLC	Polibrid 705E Elastomeric

Type P - Glass Flake Reinforced Epoxy	
Manufacturer	Approved Coating
Carboline	Approved Equal
Sherwin-Williams	Sher-Glass FF
PPG	Amerlock 2/400 GF
Tnemec	Approved Equal
AkzoNobel/International Paint, LLC	Approved Equal

Type Q - 100% Solids Epoxy for Wastewater	
Manufacturer	Approved Coating
Carboline	Plasite 4550-S Novolac Epoxy
Sherwin-Williams	Dura-Plate 6000 Amine Epoxy
PPG	Novaguard 890 or Novaguard 810 Novolac Epoxy
Tnemec	Perma-Glaze Series G435 Modified Polyamine Epoxy
AkzoNobel/International Paint, LLC	Approved Equal

B. Petrolatum (Wax) Tape:

1. Petrolatum (wax) tape must be installed per the manufacturer's written recommendations. Provide all primers and appurtenant materials as required for installation per the recommendations.
2. Approved Manufacturers:
 - a. Trenton Corp. - Trenton Primer and #1 Wax-tape
 - b. Denso North America, Inc. - Denso Paste and Densyl Tape
 - c. Approved equal.

2.03 COLOR SELECTION

- A. The color chart must include the complete available range of colors, including tints and shades. Owner will select the colors during construction.
- B. Use a multi-color system coating for any surface receiving more than one coat. Each coat must be tinted differently from the preceding coat in a manner that will allow the various coats to be easily distinguished. Colors must generally be from light to dark shades, but the Contractor may have the option to select tint shades to insure coats will receive adequate coverage without bleeding or otherwise showing through the preceding coat.
- C. Piping and equipment must be color coded in accordance with the requirements of the TCEQ.

3.00 EXECUTION

3.01 GENERAL

- A. All coatings must be applied in strict conformance with the coating manufacturer's published specifications, this Section, or as approved by the Engineer.
- B. Surfaces which will be inaccessible after installation must be coated prior to installation, or must be coated and approved in stages as the Work is installed.
- C. The Engineer will approve surfaces for application of coatings at each stage. Any material that is coated prior to the Engineer's approval will be stripped back to bare metal and repainted.
- D. At least 7 days or as required by the coating manufacturer, must be allowed for drying of finished surfaces before any machinery can be placed into service.
- E. The number of coats called for in this Section are considered the minimum required. If more coats are required for complete coverage and uniform appearance they must be provided at no additional cost to the Owner.

3.02 STEEL SURFACE PREPARATION

- A. The adequacy of the preparation of steel surfaces will be determined by comparing the surface with SSPC-VIS 1 and SSPC-VIS 3. Prepare surfaces in accordance with the following requirements:
 - 1. SSPC-SP 1 — Solvent Cleaning.
 - 2. SSPC-SP 2 — Hand Tool Cleaning.
 - 3. SSPC-SP 3 — Power Tool Cleaning.
 - 4. SSPC-SP 5 / NACE 1 — White Metal Blast Cleaning.
 - 5. SSPC-SP 6 / NACE 3 — Commercial Blast Cleaning.
 - 6. SSPC-SP 7 / NACE 4 — Brush-Off Blast Cleaning.
 - 7. SSPC-SP 10 / NACE 2 — Near-White Blast Cleaning.
 - 8. SSPC-SP 11 — Power Tool Cleaning to Bare Metal.
- B. The resulting surface profile must be in accordance with the coating manufacturer's recommendations.
- C. "Solvent Cleaning" must be performed prior to subsequent surface preparation, including abrasive blast cleaning.
- D. All sharp edges and welds must be ground smooth to a rounded contour and all weld splatter must be removed prior to abrasive blasting. Edges of metal to be coated must be rounded to a minimum of 1/16-inch radius of chamfered a minimum of 1/16 inch at an angle of 45 degrees.
- E. Welds and adjacent areas:
 - 1. Prepared such that there is:
 - a. No undercutting or reverse ridges on the weld bead.

- b. No weld spatter on or adjacent to the weld or any other area to be painted.
- c. No sharp peaks or ridges along the weld bead.
- d. Grind embedded pieces of electrode or wire flush with the adjacent surface of the weld bead.

2. Weld profiles must conform to NACE RP0178, Profile 'D'.

3.03 DUCTILE IRON PIPE AND FITTINGS SURFACE PREPARATION

- A. Prepare surfaces in accordance with the following requirements:
 - 1. NAPF 500-03-01 — Solvent Cleaning.
 - 2. NAPF 500-03-02 — Hand Tool Cleaning.
 - 3. NAPF 500-03-03 — Power Tool Cleaning.
 - 4. NAPF 500-03-04 — Abrasive Blast Cleaning for Ductile Iron Pipe.
 - 5. NAPF 500-03-05 — Abrasive Blast Cleaning for Cast Ductile Iron Fittings.
- B. "Solvent Cleaning" must be performed prior to subsequent surface preparation as specified in NAPF 500-03.

3.04 PETROLATUM (WAX) TAPE

- A. Petrolatum (wax) tape must be installed per the manufacturer's written recommendations. Provide all primers and appurtenant materials as required for installation per the recommendations.
- B. Tape must be installed on all buried flexible couplings and at locations indicated on the Drawings and as specified.

3.05 CONCRETE SURFACE PREPARATION

- A. The adequacy of the preparation of concrete surfaces will be determined by comparing the surface with ICRI Surface Finish Comparators. Prepare surfaces in accordance with the following requirements:
 - 1. SSPC-SP 13 / NACE 6 — Surface Preparation of Concrete.
- B. Allow a minimum of 28 days curing time to elapse before coatings are applied. Concrete surfaces which are scheduled to receive coatings must be in accordance with the coating manufacturer's moisture requirements.
- C. Bug holes, air pockets, and other voids in the concrete will be filled or patched in chemical exposure areas, secondary containment, and where specifically required.
- D. Concrete Surface Preparation Inspection:
 - 1. Adhesion Testing:
 - a. Tensile testing of the surface preparation must be performed by the Contractor using a Type 4 or Type 5 pneumatic adhesion testing equipment in accordance with ASTM D7234 using 2-inch diameter dollies for concrete surface adhesion testing.

Provide a minimum of three tests (dollies) per area and coating system. Engineer will select location of test dollies.

- b. Concrete surface or applied coating must be scored for concrete adhesion testing.
- c. Adhesive failure greater than 50 percent of the dolly surface area indicates inadequate surface preparation.
- d. Cohesive failures which results in loss of sound concrete will be acceptable provided the loss is greater than 50 percent of the dolly surface area.
- e. Low adhesion cohesive failures with a thin layer of concrete due to weak concrete or laitance over 50 percent of the dolly surface will be rejected.

2. Concrete Soundness:

Concrete soundness will be determined using the scratching or hammer impact methods as defined in SSPC-SP 13.

3. Moisture Content:

Moisture must be tested as specified in SSPC-SP 13 and in accordance with ASTM D4263 and ASTM F1869. Moisture content cannot exceed the moisture content recommended by the coating manufacturer.

3.06 SURFACE PREPARATION

- A. Clean and degrease surfaces prior to abrasive blasting by solvent cleaning as specified using solvents, detergent/water, emulsions, and steam. Proposed method must be documented in the coating plan. Contractor must contain and properly dispose of all runoff and debris from cleaning.
- B. If the following conditions exist or are prevalent, surface preparation and coating must be delayed or postponed until conditions are favorable. Each day's coating must be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions or changes. No surface preparation can begin or coating applied:
 - 1. When the surface, air or material is below or above the manufacturer's printed instructions.
 - 2. When surfaces are wet or damp.
 - 3. During weather conditions of rain, snow, fog or mist.
 - 4. When the air and steel temperature is less-than or equal to 5 deg. F above the dew point temperature.
 - 5. If the relative humidity is above 85 percent.
 - 6. When it is expected that the air and/or surface temperature will be below or above the coating manufacturer's recommended temperatures within 4 hours after applications of coating, minimum. Coating manufacturer may require additional time between application and temperature and weather changes.

C. Shop Surface Preparation:

1. Notify Engineer at least 7 days prior to start of shop blast cleaning to allow for inspection of the Work during surface preparation and shop application of paints. Work is subject to the Engineer's approval before shipment to the Site.
2. Items such as structural steel, metal doors and frames, metal louvers, and similar items as reviewed by the Engineer may be shop prepared and primed. Centrifugal wheel blast cleaning is an acceptable alternate to shop blast cleaning. Blast clean and prime in accordance with the Specifications.
3. Prepare surfaces by abrasive blasting as specified and apply shop prime coat. Shop primed steel plates must not have primer extended within 4 inches along all edges to be welded. All primer within 4 inches of an area to be welded must be removed prior to welding. Welding of painted surfaces will not be allowed.

D. All pre-assembled shop primed items must be prepared in accordance with these specifications and inspected by the Owner's representative before and after priming.

E. Abrasive Blasting:

1. Prior to extensive abrasive blasting operations, the Contractor must perform a test blast to verify that the surface cleanliness and profile meet the requirements of this Section and meet the coating manufacturer's requirements for the coating to be applied. If the test section does not meet the requirements, the Contract must make changes to the abrasive materials and methods to provide suitable blast.
2. Abrasive blast only the amount of surface area which can be primed the same day or before any rust starts to form, whichever occurs first. Areas which are not painted the same day must be re-blasted on the day the prime coat is applied.
3. Shrouding or recovery of all blast material will be mandatory during all exterior blasting.
4. Contractor must contain all waste and process discharge in accordance with the accepted methods for the process and materials that are in abatement.
5. Where abrasive blast cleaning will not remove or properly prepare metal surfaces, hand and/or power tool cleaning must be used to remove such conditions as weld splatter, laminations and radius-sharp edges. Hand tool or power tool must be used on areas less than 2 feet in diameter or smaller or on corners and edges.
6. All abrasive blast equipment must be equipped with, including but not limited to the following:
 - a. Noise reducing devices.
 - b. Hose coupling safety devices.
 - c. Electrical grounding devices.
 - d. Moisture traps and filters.
 - e. Fresh air hoods for all blasters.
 - f. "Dead Man" switches on all blast hoses.
 - g. Air dryers.

- F. Surface profile must be in accordance with manufacturer's printed requirements.
- G. The adequacy of the preparation of surfaces must be determined by comparing the surface with SSPC-VIS 1, SSPC-VIS 3, NACE RP0178 and ICRI Surface Finish Comparators.
- H. Adequate surface preparation must be verified throughout surface preparation per SSPC-PA 17. Minimum testing requirements:
 - 1. Test the surface profile within the first 15 minutes and one additional time during each work shift or 12-hour period, whichever is shorter for each gun or blasting apparatus used or at any time the process producing the acceptable profile indicated above is changed, as interpreted by the Engineer.
 - 2. Select a minimum of three 6-inch square locations and take two readings. The average to the two readings is a "profile measurement." The group of three locations is the "location average." The location average must be within the specified profile range.
 - 3. Contractor must report the location averages (lowest location average and highest location average, and the profile measurement for each surface preparation apparatus.
 - 4. If the substrate has been previously coated, an existing profile may exist. Contractor must adjust blast media size to ensure that the surface profile yield meets the profile required.
- I. Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning", or similar words of equal intent are used in the Specifications or in paint manufacturer's specifications, they are understood to refer to the applicable specifications indicated.
- J. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacuum-blasting methods may be required. Coating manufacturer's recommendations for wet blast additives and first coat application will apply.
- K. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wiped with a tack cloth.

3.07 PREPARATION OF HOT-DIP GALVANIZED COATED IRON OR STEEL PRODUCTS

- A. Remove all soluble and insoluble contaminants. Prepare hot-dip galvanized coated iron and steel products in accordance with ASTM D6386 and abrasive blast per ASTM D6386 to achieve an angular anchor profile as required by the coating manufacturer.
- B. Contractor is responsible for coordinating with the coating manufacturer to verify compatibility of the specified coating system with the provided surface preparation.

3.08 PREPARATION OF EXISTING COATED OR SHOP PRIMED SURFACES

- A. General:
 - 1. Factory-applied primers to equipment must be those specified or verified by the Contractor to be compatible with the specified coating systems. Where possible, notify manufacturers which shop prime coats will be required in order to be compatible with field-applied finish coats.

Where equipment is purchased which has the manufacturer's standard primer or a factory finish which is other than as specified in this Section, remove the factory-applied paint system or apply passivators or other special coatings as required to make the surface compatible with the finish coat specified.

2. Do not apply any coating to machinery, piping, or other surfaces before testing has been completed and systems approved. Any damage to coatings resulting from subsequent corrective procedures must be stripped back to bare metal and repainted with the appropriate paint system as directed by the Engineer.
 3. Check for compatibility when applying coatings over existing coatings. Apply a test patch of the recommended coating system, covering at least 2 to 3 square feet or as directed by the Engineer. Allow to cure 1 week before testing adhesion per ASTM D3359 in the presence of the Engineer. If adhesion does not meet the manufacturer's published data, consult with the Engineer.
 4. Shop primed or coated surfaces must be reviewed with the Engineer to determine if the extent of damage to the coating and suitability of finish coats to adhere to shop applied coats.
 5. If a cured epoxy, polyurethane, or plural-component material is to be top coated provide brush-off blast as specified herein or as recommended by the coating manufacturer.
 6. Surface preparation recommendations of coating manufacturer are subject to approval of the Engineer.
- B. To be recoated or final coated:
1. Solvent clean.
 2. Perform touch-up repairs of existing coating.
 3. Asphaltic coated ductile iron pipe will require an application of a seal coat prior to the application of a cosmetic finish coat.
- C. Touch-Up Repairs:
1. Clean loose, abraded, or damaged coatings to substrate by power tool to bare metal per SSPC-SP 11 and/or NAPF 500-03-03 "Power Tool Cleaning."
 2. Feather surrounding intact coating.
 3. Apply one spot coat of the specified primer to bare areas overlapping the prepared existing coating.
 4. Apply one full finish coat of the specified primer or finish coat(s) overall.
- D. Application of a Cosmetic Coat:
1. The exact nature of shop-applied coatings is not known in all cases.
 2. Check compatibility by application to a small area prior to starting the coating.
 3. If lifting or other problems occur, request disposition from the Engineer.

3.09 APPLICATION

- A. Contractor and painting technicians are responsible for the application of the coating system and must have current applicator approvals from the coating manufacturer, as required.
- B. After abrasive blast cleaning, dust and spent abrasive must be removed from the surfaces by vacuum process or with clean, dry, oil-free compressed air.
- C. The prime coat must be applied as soon as possible after the blasting and surface cleaning is completed, inspected and approved by the Inspector. Blasted surfaces must be coated before rust forms on the surface. No prepared surface will be allowed to receive a coating if "rust bloom" or surface discoloration has occurred. All blasted surfaces must be coated to within 6 inches of the edge of a blasted area. No visible rust must be coated under any circumstances, including rust bloom or if discoloration has occurred, regardless of elapsed time between blasting and coating.
- D. Provide mist coat if recommended by the coating manufacturer.
- E. All weld seams, gaps, edges, bolts and difficult areas to coat must receive a stripe coat. Stripe coat must be a contrasting color. Stripe coat may be applied with intermediate or finish coating.
- F. Contractor must apply each coat at the rate and in the manner specified by the coating manufacturer, except as may be modified herein. If material has thickened or must be diluted for application, coating must be built up to the same dry film thickness as specified for each coat of the complete system.
- G. Maximum and minimum DFT must be per the supplied coating manufacturer's printed requirements and as required by this Section. DFT will be measured per SSPC-PA 2, Level 3 with an allowable measurement of spot DFT of:
 - 1. 80 percent of minimum DFT specified.
 - 2. 120 percent of maximum DFT specified.
- H. Contractor and painting technicians are responsible for the application of coating system and must have current applicator certifications from the coating manufacturer. Submit certifications with coating submittal.
- I. Coatings which have an expired shelf or pot life may not be used and must be removed from the Site.
- J. Coating must be applied by skilled workmen and must be brushed out or sprayed evenly, without runs, crazing, sags, or other blemishes.
- K. Sand between coats to remove over spray and dry fall.
- L. Apply the first coat to the surface, including cutting in around edges, before the second coat is applied. The second coat and any successive coats must not to be applied before notifying the Owner's field representative and obtaining approval. Each coat must be tested before the successive coat is applied.
- M. The coating curing period must be adjusted to compensate for less than adequate weather conditions, as recommended by the coating manufacturer, for complete curing of the entire coating system. The full curing time recommended by the manufacturer must be provided.

- N. Coating must be continuous and must be accomplished in an orderly manner to facilitate proper inspection control.
- O. Where a roller or brush is used to apply the coating, additional coats may be necessary to achieve the recommended dry film thickness and/or to achieve total coverage of the underlying surface. Coated surfaces must be totally free of all roller nap, roller marks, brush bristles and brush marks.
- P. When using conventional coating spray equipment for coating operations, effective oil and water separators combined with after coolers or deliquescent dryers must be used in compressed air lines to remove detrimental oil and moisture from the air. Separators must be placed as far as practical from the compressor. Compressors may be tested periodically by the Owner's representative for oil and water contamination of compressed air. Testing must follow ASTM D4285. All compressor units found to produce unacceptable amounts of oil and or water, as determined by results of ASTM D4285 test data and interpretation of data by the Owner's representative must be replaced with a compressor that is acceptable.
- Q. For porous surfaces, such as concrete or masonry, a prime coat may be thinned to provide maximum penetration and adhesion. The type and amount of thinning must be determined by the coating manufacturer and is dependent on surface density and type of coating.

3.10 WATER AND WASTEWATER PIPE COLORS

- A. General coating colors in accordance with the TCEQ are as follows for general selection of pipe coatings. Contractor must provide samples for Engineer's approval prior to ordering as specified.

Pipe/Pumps/Valves System Description	Color
Backwash Waste/Drain	Dark Grey
Clarified Water	Green
Effluent after Clarification	Dark Green
Filter Effluent	Light Blue
Gray Water	Purple with Yellow Lettering
Heated Water	Blue with 6-inch Red Bands, spaced 30-inches apart
Potable Water/Treated Water	Light Blue
Power Conduits	In compliance with the NFPA 70 National Electrical Code
Raw Water	Tan
Reclaimed Water	Purple with Black Lettering
Sewage	Grey
Waste Water/Sewage	Brown

Chemical Lines	Color
Liquid Alum	Yellow w/Orange Bands

Chemical Lines	Color
Alum (solution)	Yellow w/ Green Bands
Ammonia	Yellow w/ Brown Bands
Chlorine (gas, liquid, or vent)	Yellow
Chlorine (solution)	Yellow w/ Red Bands
Chlorine Dioxide (solution)	Yellow with Blue Bands
Ferric Chloride	Brown with Red Bands
Ferric Sulfate	Brown with Yellow Bands
Fluoride	White with Yellow Bands
Liquid Caustic	White with Red Bands
Caustic (solution)	White with Orange Bands
Polymers	Orange w/ Green Bands or White with Green Bands (Varies for Water or WW applications)
Ozone	Stainless Steel with White Bands
Settled Water	Green
Sulfur Dioxide	Lime Green with Yellow Bands

Other Lines	Color
Compressed Air	Light Green
Instrument Air	Light Green with Dark Green Bands

3.11 FIELD QUALITY CONTROL

- A. Field Tests: Make wet film tests during painting operations to ensure proper thicknesses of coating are being applied. After each coat has been applied, test the paint film thickness with a nondestructive, magnetic type thickness gauge. The total dry-film thickness for each coat must be per Paragraph 3.09.G. Apply additional coats until the specified thickness is reached or exceeded.
- B. Holiday Testing
 1. Holiday testing must be performed in accordance with ASTM D5162 for steel substrates and ASTM D4787 for concrete substrates.
 2. Test the entire surface of coated steel and piping in moderate or severe environments, as determined by the Engineer, with a holiday detector. For thickness between 10 and 20 mils (250 to 500 microns) a non-sudsing type wetting agent, as recommended by the holiday detector manufacturer, must be added to the water prior to wetting the detector sponge.
 3. Holiday detect coatings in excess of 20 mils with high voltage holiday testers as recommended by the coating manufacturer.

4. Mark and repair failures in accordance with the manufacturer's printed instructions, then retest failure areas. No failures or other irregularities will be permitted in the final coats. Areas containing holidays must be repaired until tests indicate no holidays.

3.12 PROTECTION OF SURFACES NOT TO BE PAINTED

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted.
- B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
- D. Mask openings in motors to prevent paint and other materials from entering the motors.

3.13 DAMAGED COATINGS, PINHOLES, AND HOLIDAYS

- A. Feather edges and repaired in accordance with the recommendations of the paint manufacturer.
- B. Repair fusion bonded coatings to be as recommended by the original applicator. Applicator must provide liquid repair kits for this purpose as recommended by the coating manufacturer.
- C. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

3.14 UNSATISFACTORY APPLICATION

- A. If the item has an improper finish color, or insufficient film thickness, clean and topcoat surface with specified paint material to obtain the specified color and coverage. Obtain specific surface preparation information from the coating manufacturer.
- B. Hand or power sand visible areas of chipped, peeled, or abraded paint and feather the edges. Follow with primer and finish coat in accordance with the Specifications. Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required.
- C. Evidence of runs, bridges, shiners, laps, or other imperfections are cause for rejection.
- D. Repair defects in coating system per written recommendations of coating manufacturer.
- E. Leave all staging up until the Engineer has inspected the surface or coating. Replace staging removed prior to approval by Engineer.

3.15 COATING INSPECTION

- A. General:
 1. All coats will be subject to inspection by the Engineer and the coating manufacturer's representative.
 2. Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.

3. Give particular attention to edges, angles, flanges, and other areas where insufficient film thicknesses are likely to be present and ensure proper millage in these areas.
- B. Coating Thickness Testing:
1. Owner's representative may conduct coating thickness testing as necessary and without limitation.
 2. Measure coating thickness specified in mils with an electronic type dry film thickness gauge.
 3. Check each coat for the correct millage.
 4. Tests for concrete coating thickness may be taken using a Tooke Gauge or gauge approved for testing coatings over concrete substrates. Contractor must repair coating after thickness testing, if required.
- C. Coating Continuity (Holiday) Testing: Owner's representative will witness holiday testing performed by the Contractor.

3.16 CLEANING AND ADJUSTING

- A. Promptly remove trash and debris resulting from painting operation from the Site. Remove drop cloths, masking tapes and other protective coverings. Remove paint spills, splatters, overlap of paint from adjacent material and other defects. Spot paint nicks and other defects.
- B. Remove paint containers and waste products. Thoroughly clean paint storage rooms, removing spilled paint from walls and floors.
- C. Damages due to over spray on buildings, vehicles, trees, or other surfaces not specified to be painted would be the responsibility of the Contractor.

3.17 SCHEDULE

- A. Protective coatings must be applied in accordance with the following paint schedule. If additional or alternate primers, etc. are recommended by the coating manufacturer for any of the coatings specified, they must be provided at no additional cost to the Owner to provide a complete and compatible coating system, as approved by the Engineer.

PROTECTIVE COATINGS PAINT SCHEDULE

System	Application Description	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
No. 1	Submerged Metal - Potable Water All metal surfaces new and existing below a plane 1 foot above the maximum liquid surface, metal surfaces above the maximum liquid surface which are a part of the immersed equipment, concrete embedded surfaces of metallic items under submerged or buried conditions, such as wall pipes, pipes, wall or floor sleeves, access manholes, gate guides and thimbles, and structural steel. Not to be used for potable water storage tanks. All coatings must be NSF 61 certified.	SSPC-SP 1 SSPC-SP 10 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05	TYPE H - Epoxy-Polyamide TYPE H - Stripe Coat TYPE H - Epoxy-Polyamide	1	4.0
				2	4.0
				Total Minimum Dry Film Thickness	
No. 2	Above-Grade Interior/Exterior Steel and D.I. Piping Non-Immersion/Non-Corrosive Environment All metal surfaces new and existing, such as inside pump station buildings, exterior piping and valves, exterior structural steel, etc. Application Notes: 1. Intact Factory Applied Epoxy Coatings on Valves and Piping - Abrade surface to create a surface profile and spot prime with Epoxy Mastic. Coat with penetrating sealer and continue with stripe, intermediate and top coat as indicated. 2. Previously Coated and Corroded Piping and Valves - Prepare as indicated to the right and provide full coat of Epoxy Mastic and continue with stripe, intermediate and top coat as indicated.	For New Piping and Valves: SSPC-SP 1 SSPC-SP 6 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05 For Previously Coated Piping and Valves: SSPC-SP 1 SSPC-SP 3 NAPF 500-03-01 NAPF 500-03-03	TYPE N - Epoxy Mastic TYPE C - Penetrating Epoxy Pre-Primer TYPE M - Stripe Coat Type M - HS Epoxy Siloxane	1	5.0
				1	2.0
				1	5.0 - 7.0
Total Minimum Dry Film Thickness					12 mils
No. 3	Concrete Floor Surfaces of Interior Chemical Storage Areas All new and existing interior concrete floors, such as inside pump station buildings and chemical storage areas. All coatings must include skid-resistant additives.	SSPC-SP 13 ICRI CSPS2-4	TYPE L - Epoxy/Vinyl Ester	1	25 mils
Total Minimum Dry Film Thickness					25 mils

System	Application Description	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
No. 4	Electrical Equipment - Exterior All new and existing exterior electrical panels and equipment with factory coatings. Not for pumps and motors.	SSPC-SP 1 SSPC-SP 2	TYPE A - Alkyd-Phenolic Universal Primer	1	2.0
			TYPE F - Stripe Coat	2	3.0
			TYPE F - Alkyd Enamel		
Total Minimum Dry Film Thickness					8.0 mils
No. 5	High-Temperature Surfaces Interior and exterior surfaces of surfaces with temperatures from 200 to 400 deg. F.	SSPC-SP 1 SSPC-SP 10	TYPE J - Silicone Aluminum	2	1.0
Total Minimum Dry Film Thickness					2.0 mils
No. 6	Metal Piping and Valves - Immersion in Wet Wells Moderate to Severe Environment (Non-Potable) Exterior protection of submersed valves & pumps, penstocks, piping, sewer interceptors, wastewater vessels, settling tanks and buried piping connecting to them.	SSPC-SP 1 SSPC-SP 10 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05	Type P - Glass Flake Reinforced Epoxy	1 - 2	20.0
Total Minimum Dry Film Thickness					20 mils
No. 7	New and Existing Metal Piping and Valves within Vaults and Under Insulation Moderate to Severe Environment All metal surfaces new and existing that will be installed in areas where temporary submerged conditions can occur, such as within vaults and for piping and valves covered with insulation. Application Notes: 1. Intact Factory Applied Epoxy Coatings on Valves and Piping - Abrade surface to create a surface profile and spot prime with Epoxy Mastic. Coat with penetrating Sealer and continue with stripe, intermediate and top coat as indicated. 2. Previously Coated and Corroded Piping and Valves - Prepare as indicated to the right and provide full coat of Epoxy Mastic and continue with stripe, intermediate and top coat as indicated.	For New Piping and Valves: SSPC-SP 1 SSPC-SP 6 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05 For Previously Coated Piping and Valves: SSPC-SP 1 SSPC-SP 3 NAPF 500-03-01 NAPF 500-03-03	TYPE N - Epoxy Mastic TYPE C - Penetrating Epoxy Pre-Primer TYPE G - Stripe Coat TYPE G - Epoxy-Polyamide	1	4.0
				1	
				2	4.0
				Total Minimum Dry Film Thickness	

System	Application Description	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
No. 8	New Piping and Steel - Submerged and Non-Submerged - Interior - Severe Environment Interior protection of steel and piping in severe conditions with exposure to H2S gas, including wastewater digesters, etc. Application Notes: 1. Coating may be applied in two coats, as recommended by the manufacturer.	SSPC-SP 1 SSPC-SP 10 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05	TYPE Q - 100% Solids Epoxy	1	40.0
Total Minimum Dry Film Thickness					40 mils

END OF SECTION

22 14 29.16 SUBMERSIBLE SUMP PUMPS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install submersible sump pumps. Provide a sump pump capable of fitting in the size sump shown. Any structural modifications required at the structure shall be made at no additional cost to the Owner. The pump and motor shall have a standard manufacturer's nameplate securely affixed in a conspicuous place showing the serial number, model number, manufacturer, ratings, and other pertinent nameplate data.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: The intent of these specifications is to purchase a quality product of the manufacturer's latest design, meeting the minimum standards set forth. Proposed equipment shall have not less than 5 years of satisfactory service.
 - 1. Acceptable manufacturers shall be one of the following:
 - a. Little Giant
 - b. Goulds
 - c. Dayton
- B. Manufacturer's Representative for Startup and Testing: The services of the Manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's operating personnel, troubleshooting and other services as required in Section 01 75 00 "Starting and Adjusting."

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings.
 - 2. Operation and Maintenance Manuals.
 - 3. If requested, the Equipment Manufacturer shall submit a list of 10 similar installations which have been in satisfactory operation for at least 3 years.

1.04 DELIVERY AND STORAGE

- A. Store equipment with protection from the weather, excessive humidity and temperature, dirt, dust and other contaminants and in compliance with the manufacturer's instructions.
- B. Spare parts shall be packed and shipped in containers bearing labels clearly designating contents and pieces of equipment for which it is intended.

2.00 PRODUCTS

2.01 SUBMERSIBLE SUMP PUMPS

- A. The sump pumps shall have cast iron motor housing and volute, thermoplastic or cast iron impellers, and a stainless steel shaft. The sump pump manufacturer shall verify that the pump being provided shall fit into the size sump shown and that the sump pump shall not cycle excessively.

2.02 MOTOR

- A. The motor shall be totally-encased, sealed, non-ventilating and shall have automatic thermal overload protection. The motor shall be a minimum of 0.5-HP, 115-volt, 1750-rpm and shall be suitable for continuous duty.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install submersible sump pumps in accordance with the Manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of equipment, an acceptance test to verify the satisfactory operation of each unit shall be conducted. The test shall be conducted in a manner approved by and in the presence of the Engineer. Units shall be checked for excessive noise, vibration, general operation, etc. The units must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.

3.03 SCHEDULES

- A. Each pump shall be as scheduled:

Location	No. of Pumps	Capacity (gpm)	Max TDH (feet)	Max Shutoff Head (feet)	Motor HP Max
Bulk Chemical Storage Facility	2	40	15	50	2

END OF SECTION

31 05 13 SOILS FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section of the specifications describes the various classes of Earth Fill. All of the classes of Earth Fill contained in this specification may not be used on this project. The classes of Earth Fill used on this project are shown on the drawings or specified in other sections of the specifications. This Section does not include specifications for placement and compaction of Earth Fill. Specifications for placement and compaction of Earth Fill are included in other sections of the specifications and/or shown on the drawings.

1.02 STANDARDS

- A. Soil materials shall be classified into the appropriate class of Earth Fill shown below according to ASTM D2487 "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" or other appropriate methods as designated by the Engineer.

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Earth Fill: Limited to clays and sandy clays classified as CH material with a liquid limit greater than or equal to 50, a plasticity index greater than or equal to 25, and a minimum of 60 percent passing the No. 200 sieve, which are free of organic materials.
- B. Class 2 Earth Fill: Limited to clays and sandy clays classified as CH and CL materials with a coefficient of permeability less than or equal to 1.0×10^{-7} cm/sec, a liquid limit greater than or equal to 30, a plasticity index greater than or equal to 15, and more than 50 percent passing the No. 200 sieve, which are free of organic materials.
- C. Class 3 Earth Fill: Consist of any materials classified as CH, CL, SM, SP, SP-SM, SC, and GC, which have a minimum plasticity index of 4, which are free of organic materials.
- D. Class 4 Earth Fill: Consist of materials which are classified as SP, SM, SC, CL, or dual classifications thereof, which have a liquid limit less than or equal to 35 and a plasticity index of a minimum of 7 and a maximum of 15, which are free of organic materials.
- E. Class 5 Earth Fill: Consist of materials classified as SP or SP-SM which have a plasticity index less than or equal to 4 and a maximum of 12 percent passing the No. 200 sieve, which are free of organic materials.
- F. Class 12 Earth Fill: Consist of soils suitable for topsoil which are relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soils for topsoil shall be subject to the approval of the Engineer.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

31 05 16 AGGREGATES FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section of the specifications describes the various classes of Aggregate Fill. All of the classes of Aggregate Fill contained in this specification may not be used on this project. The classes of Aggregate Fill used on this project are shown on the drawings or specified in other sections of the specifications. This Section does not include installation. Installation of Aggregate Fill is included in other sections of the specifications and/or on the drawings.

1.02 QUALITY ASSURANCE

- A. Classification Testing:
1. Contractor Testing:
 - a. Arrange and pay for the services of an independent testing laboratory to sample and test proposed Aggregate Fill materials.
 - b. Submit the test results to the Engineer, and obtain approval prior to providing Aggregate Fill.
 2. Owner Testing: The Owner shall arrange and pay for additional testing on the Aggregate Fill after delivery to the project site as determined necessary by the Engineer.
- B. Contamination Certification:
1. Obtain a written, notarized certification from the Supplier of each proposed Aggregate Fill source stating that to the best of the Supplier's knowledge and belief there has never been contamination of the source with hazardous or toxic materials.
 2. Submit these certifications to the Engineer prior to proceeding to furnish Aggregate Fill to the site. The lack of such certification on a potential Aggregate Fill source shall be cause for rejection of that source.

1.03 STANDARDS

- A. Aggregate Fill shall be classified into the appropriate class listed below according to ASTM testing procedures as specified for the various classes.
1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium sulfate
ASTM C125	Terminology Relating to Concrete and Concrete Aggregates
ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D448	Classification for Sizes of Aggregate for Road and Bridge Construction

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 57:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	95-100
1/2"	25-60
No. 4	0-10
No. 8	0-5

- B. Class 2 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 67:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

- C. Class 3 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 7:

Sieve Size Square Opening	Percent Passing
3/4"	100

1/2"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-5

- D. Class 4 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 467:

Sieve Size Square Opening	Percent Passing
2"	100
1-1/2"	95-100
3/4"	35-70
3/8"	10-30
No. 4	0-5

- E. Class 5 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 357:

Sieve Size Square Opening	Percent Passing
2-1/2"	100
2"	95-100
1"	35-70
1/2"	10-30
No. 4	0-5

- F. Class 6 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 1:

Sieve Size Square Opening	Percent Passing
4"	100
3-1/2"	90-100
2-1/2"	25-60
1-1/2"	0-15
3/4"	0-5

- G. Class 7 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 6:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
1/2"	20-55
3/8"	0-15
No. 4	0-5

- H. Class 8 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 56:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	90-100
3/4"	40-85

1/2"	10-40
3/8"	0-15
No. 4	0-5

I. Class 9 Aggregate Fill:

1. Consist of washed and screened gravel and natural sands or sands manufactured by crushing stones complying with the requirements of ASTM C33, except that the gradation shall be as follows:

Sieve Size Square Opening	Percent Passing
1/2"	100
3/8"	95-100
No. 4	80-95
No. 8	65-85
No. 16	50-75
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 9 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

J. Class 10 Aggregate Fill:

1. Consist of washed and screened natural sands or sands manufactured by crushing stones complying with the requirements and tests of ASTM C33. The gradation as included in ASTM C33 is as follows:

Sieve Size Square Opening	Percent Passing
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 10 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

- K. Class 11 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90
3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-12 (Wet Sieve Method)

- L. Class 12 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-12 (Wet Sieve Method)

- M. Class 13 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and shall meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90

3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-3 (Wet Sieve Method)

- N. Class 14 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-3 (Wet Sieve Method)

- O. Class 15 Aggregate Fill: Consist of durable particles of silica sand, washed clean, chemically inert, and packaged by the Supplier. The material shall meet applicable regulatory requirements for monitor well filter pack. The source of the material shall be approved by the Engineer and shall meet the following gradation requirements:

Sieve Size Square Opening	Percent Passing
No. 20	98-100
No. 40	0-2

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

31 11 00 CLEARING AND GRUBBING [CIVIL]

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide labor, materials, equipment and incidentals necessary to perform operations in connection with clearing, grubbing, and disposal of cleared and grubbed materials.

1.02 QUALITY ASSURANCE; DEFINITIONS

- A. Clearing: Clearing is defined as the removal of trees, shrubs, bushes, and other organic matter at or above original ground level.
- B. Grubbing: Grubbing is defined as the removal of stumps, roots, boards, logs, and other organic matter found at or below ground level.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION

3.01 PREPARATION

- A. Mark areas to be cleared and grubbed prior to commencing clearing operations. The Owner's Representative shall approve clearing and grubbing limits prior to commencement of clearing operations.
- B. Trees and shrubs outside of the clearing limits, which are within 10 feet of the clearing limits, shall be clearly marked to avoid damage during clearing and grubbing operations.
- C. Remove trees and brush outside the clearing limits, but within the immediate vicinity of the work, upon receipt of approval by the Owner's Representative, when the trees or brush interfere with the progress of construction operations.
- D. Clearly mark trees and shrubs within the clearing limits, which are to remain, and protect the trees and shrubs from damage during the clearing and grubbing operations.
- E. The clearing limits shall not extend beyond the project limits.
- F. Establish the clearing limits as follows:
 - 1. Excavations plus 5 feet beyond the top of the excavation.
 - 2. Concrete structures plus 10 feet beyond the edge of the footing.
 - 3. Roadways, runways, taxiways, and parking areas plus 5 feet beyond the edge of pavement or R.O.W. limits.
 - 4. Retaining walls plus 10 feet beyond the edge of the footing.
 - 5. Underground utility trench top width plus 8 feet.
- G. Establish the grubbing limits as follows:
 - 1. Concrete structures plus 2 feet beyond the edge of the footing.

2. Roadways, runways, taxiways, and parking areas plus 1 foot beyond the edge of pavement.
3. Retaining walls plus 2 feet beyond the edge of the footing.

3.02 INSTALLATION

- A. Clearing: Clearing shall consist of the felling, cutting up, and the satisfactory disposal of trees and other vegetation, together with the down timber, snags, brush, rubbish, fences, and debris occurring within the area to be cleared.
- B. Grubbing:
 1. Grubbing shall consist of the removal and disposal of stumps and roots larger than 1 inch in diameter.
 2. Extend grubbing to the depth indicated below: In the case of multiple construction items, the greater depth shall apply.
 - a. Footings: 18 inches below the bottom of the footing.
 - b. Walks: 12 inches below the bottom of the walk.
 - c. Roads and Taxiways: 18 inches below the bottom of the subgrade.
 - d. Parking Areas: 12 inches below the bottom of the subgrade.
 - e. Concrete Structures: 18 inches below the bottom of the concrete.
 - f. Retaining Walls: 18 inches below the bottom of the footing.

3.03 FIELD QUALITY CONTROL

- A. Completely remove timber, logs, roots, brush, rotten wood, and other refuse from the Owner's property. Disposal of materials in streams shall not be permitted and no materials shall be piled in stream channels or in areas where it might be washed away by floods. Timber within the area to be cleared shall become the property of the Contractor, and the Contractor may cut, trim, hew, saw, or otherwise dress felled timber within the limits of the Owner's property, provided timber and waste material is disposed of in a satisfactory manner. Materials shall be removed from the site daily, unless permission is granted by the Engineer to store the materials for longer periods.

END OF SECTION

31 23 10 STRUCTURAL EXCAVATION AND BACKFILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to complete structural excavation, filling, backfilling, and compacting; to provide protection to equipment and cuts; to include backfill material; the construction or installation of cofferdams, and other similar facilities which may be necessary to perform excavations and/or backfilling; to include the necessary pumping, bailing, or associated drainage; to remove and dispose of surplus materials, cofferdams, and debris; and to provide final grading, as required.
- B. The work does not include excavation, filling, and backfilling for utility lines, manholes, vaults, valve boxes, and related structures. Work shall be performed in accordance with Section 31 23 33 "Trenching and Backfill."

1.02 DEFINITIONS

- A. Cofferdams: Cofferdam designates any temporary or removable structure constructed to hold the surrounding earth and/or water out of the excavation, whether the structure is formed of soil, timber, steel, concrete, or a combination thereof. It shall be understood also to include the use of pumping wells or well points.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Submit qualifications of independent testing laboratory for approval.
 - 2. Backfill material classifications. Provide certification by an approved independent testing laboratory.
 - 3. Compaction test results. Provide compaction test results within 24 hours.

1.04 STANDARDS

- A. The following publications, referred to hereafter by basic designation only, form a part of this specification as if written herein in their entirety:
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

- B. Any other testing required by these specifications and not specifically referenced to a standard shall be performed under ASTM or other appropriate standards as designated by the Engineer.
- C. References herein or on the drawings to soil classifications shall be understood to be according to ASTM D2487, "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" unless indicated otherwise.

1.05 DELIVERY AND STORAGE

- A. Deposit material to be used for backfill in storage piles at points convenient for handling of the material during the backfilling operations.

1.06 JOB CONDITIONS

- A. Review the site and determine the conditions which may affect the structural excavation, prior to the commencement of the excavation.

2.00 PRODUCTS

2.01 MATERIALS

- A. Compacted Select Fill: Select fill shall be Class 4 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- B. Crushed Limestone Base Material: Conforms to Texas Department of Transportation Standard Specification Item 247, Grade 1 or 2, Type A.
- C. On-Site Fill: Soils excavated from the site free of construction debris, organic and other deleterious material.
- D. Flowable Fill: Flowable fill shall be in accordance with Section 31 23 23.34 "Flowable Fill."
- E. Lean Concrete Backfill: Lean concrete shall be in accordance with Section 03 30 00 "Cast-In-Place Concrete."
- F. Topsoil: Topsoil shall be Class 12 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- G. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and 5 to 15 percent passing No. 200 sieve; maximum plasticity index of 7; complying with deleterious substance limits of ASTM C33 for fine aggregates.

2.02 COMPACTION EQUIPMENT

- A. Compaction equipment shall conform to the following requirements and shall be utilized as specified herein.
 - 1. Pneumatic Rollers: Pneumatic rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000-pound wheel load during roller operations. The roller wheels shall be located abreast and be designed so

that each wheel will carry approximately equal load in transversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure of a 25,000-pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 10 miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Engineer.

2. Vibratory Rollers: Vibratory rollers shall have a total static weight of not less than 20,000 pounds, with at least 90 percent of the weight transmitted to the ground through a single smooth drum when the roller is standing in a level position. The diameter of the drum shall be between 5 and 5-1/2 feet and the width between 6 and 9 feet. The unsprung weight of the drum, shaft, and internal mechanism shall not be less than 12,000 pounds. The frequency of vibration during operation shall be between 1100 and 1500 i.e., and dynamic force shall not be less than 40,000 pounds at 1400 i.e. No backing of the vibratory roller will be allowed on the embankment unless the vibrating mechanism is capable of being reversed. Self-propelled and towed vibratory rollers shall be operated at speeds not exceeding 3 miles per hour and 1-1/2 miles per hour, respectively.
3. Power Hand Tampers and Vibratory Plate Hand Compactors: Compaction of material in areas where it is impracticable to use a roller or tractor shall be performed with approved power hand tampers, vibratory plate hand compactors, or other approved equipment. Approval shall be based upon performance in a test section.

3.00 EXECUTION

3.01 PREPARATION

- A. Clear and grub the area to be excavated prior to the start of excavation in accordance with Section 31 11 00 "Clearing and Grubbing."

3.02 EXCAVATION

- A. When footing concrete is to rest upon rock, remove the rock to a depth sufficient to expose sound rock. Level off or cut the rock to approximate grades, and roughen the area. When footing concrete is to rest on an excavated surface other than rock, take care not to disturb the bottom of the excavation, and do not make final removal of the foundation material to grade until just before the concrete is placed.
- B. For footings where the soil encountered at established footing grade is an unstable material, use the following procedure unless other methods are specified: Remove unstable soil. Carry the excavation at least 1 foot beyond the horizontal limits of the structure on all sides. Replace the unstable soil with compacted select fill. Place in uniform layers at a suitable depth for compaction. Wet each layer if necessary and compact by rolling or tamping to provide a stable foundation for the structure.
- C. When unfeasible to construct a stable footing as outlined above, construct footing by the use of special materials, such as flexible base, cement stabilized base, cement stabilized backfill, or other material, as directed by the Engineer.

- D. Perform excavation to permit surfaces to be brought to final line and grade within plus or minus 0.1 foot. Restore over-break at the Contractor's expense. In general, perform excavation in open-cut from the surface of the ground and at the line and grade indicated.
- E. The sides of the excavation, from the bottom of the excavation to the top of the ground shall be supported in accordance with OSHA requirements. Maintain the supports throughout construction. Remove supports after the completion of the work.

3.03 COFFERDAMS

- A. The interior dimensions of the cofferdams shall provide sufficient clearance for the construction, inspection (inside and outside), and the removal of any forms and to permit pumping outside of the forms. In general, extend sheet pile cofferdams well below the bottom of the footings and brace well. Cofferdams shall be as watertight as practicable.
- B. When a concrete seal is required by the plans, base the design on the normal water elevations as indicated. If the foundation concrete can be placed in the dry under construction conditions, the seal will shall not be required. If an additional seal is necessary for the conditions existing at the time of construction, increase the seal thickness as necessary. If the conditions existing at the time of construction require a seal for placing the foundation concrete in the dry, and none is provided in the plans, place an adequate seal.
- C. When the Engineer judges it to be impractical to de-water a cofferdam before placing a concrete seal around piling driven therein, extend the excavation below the footing grade, deep enough to allow for swell of material during pile driving operations. After driving the piling, remove the foundation material that has risen to a level more than 1 foot above the footing grade. It is the intention of this provision to establish a construction tolerance to be applied when a foundation is being constructed under water. Where possible to de-water the cofferdam without placing a seal, remove the foundation material to exact footing grades after piling are driven. Backfilling in a foundation to compensate for excavation which has been extended below grade shall not be permitted. Fill areas which are below grade with concrete at the time the seals or footings are placed.
- D. Unless otherwise indicated, remove cofferdams after the completion of the substructure without disturbing or marring the structure.

3.04 DEWATERING OF SITE

- A. Pumping or bailing from the interior of any foundation enclosure shall be done in a manner which precludes the possibility of movement of water through or alongside any concrete being placed. No pumping or bailing shall be permitted during the placing of structural concrete, or for a period of at least 24 hours thereafter, unless from a suitable sump separated from the concrete work by a water-tight wall. Pumping or bailing during placement of seal concrete shall be only to the extent necessary to maintain a static head of water within a cofferdam. Do not start pumping or bailing to de-water a sealed cofferdam until the seal has aged at least 36 hours.

3.05 PLACEMENT OF MATERIAL

- A. General:

1. Backfill excavated spaces and areas not occupied by the permanent structure, except that no backfill shall be placed against any structure until the concrete has reached its 28-day compressive strength or 7 days whichever is longer. Do not place backfill adjacent to support walls until the top slab has been in place at least 4 days.
 2. Take care to prevent wedging action when placing backfill around structures. If backfill is to be placed on two or more sides of the structure or facility, simultaneously place the backfill on all sides to avoid uneven loading on the structure.
 3. Do not permit rollers to operate within 3 feet of structures.
 4. Maximum placement lifts measured in the loose condition are as follows:
 - a. 8 inches when heavy compaction equipment is used.
 - b. 4 inches when hand-directed compaction equipment is used.
 5. Subgrade preparation for slab-on-grade:
 - a. Provide a 3-inch layer of compacted Fine-Graded Granular Material.
- B. Moisture Control:
1. General: The materials in each layer of the fill shall uniformly contain the amount of moisture within the limits specified below necessary to obtain the maximum dry density for the soil. Compact Class 1 and Class 2 Earth Fill with a moisture content of at or within 5 percentage points wet of optimum moisture content. Compact Class 3, Class 4, and Class 5 Earth Fill with a moisture content within 2 percentage points dry to 3 percentage points wet of optimum moisture content. Compact Crushed Limestone Base Material with a moisture content within 2 percentage points dry to 2 percentage points wet of optimum moisture content. Compact On-Site Soils with a moisture content within 1 percentage points dry to 4 percentage points wet of optimum moisture content. The moisture content ranges specified above for the various classes of earth fill represent maximum upper and lower limits of the particular range. Determination of the maximum dry density-optimum moisture shall be by one or more of the following ASTM procedures D1556 or D6938. Completely cohesionless materials which are to be compacted to a specified relative density shall be at a moisture content which will allow use of the specified compaction equipment and consistent achievement of the specified density.
 2. Moisture Control During Placement: After spreading the soil, adjust the moisture content of the soil if necessary by either aeration or the addition of water to bring the moisture content within the range specified. Uniformly distribute the moisture content throughout the layer of soil to be compacted. In order to accomplish this distribution, thoroughly mix the layer of soil by disking, harrowing, or by the use of a power-driven pulverizer. Should the surface of a previously compacted layer become dry due to exposure to the elements, appropriately wet surface of the compacted layer prior to placing the succeeding layer of soil, and properly disk or harrow the surface. Should a layer of soil be over wet, allow the layer to dry to a proper moisture content prior to compacting. Should the surface of a layer become smooth and hard, roughen the surface by scarifying, and wet the surface if necessary prior to placing the next layer of soil. Reprocess any layer which becomes damaged by weather conditions to meet the

specification requirements. There shall be no additional payment made for such reprocessing.

C. Compaction:

1. Compaction shall be by power hand equipment or rubber tired equipment, provided the rubber tired equipment does no damage. Compaction by power hand equipment or rubber tired equipment shall be completed such that there will be a 24-inch overlap by roller compaction.
2. Compact the Class 1 and Class 2 Earth Fill zones by a minimum of eight passes with a tamping roller. Compact the Class 3, Class 4, and Class 5 Earth Fill zones by a minimum of eight passes with a tamping roller or by a minimum of four passes with a tamping roller, followed by a minimum of four passes with a pneumatic roller. A vibratory roller shall be required if the material is sandy and if requested by the Engineer. A pass shall consist of one trip over the area being compacted. The front and rear axle rollers on self-propelled models shall only be considered as one pass per trip. The initial and final area to be rolled shall each have eight passes. Stagger passes between the initial and final area in order to establish overlapping with at least eight passes at all locations. Approve the exact method based upon the test section. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section where there is sufficient area to permit these operations to proceed simultaneously.
3. Areas of the fill being compacted with power hand tampers or vibratory plate hand compactors shall receive a minimum of eight passes of the equipment with an overlap of 50 percent of the equipment base plate width.
4. The in-place density of Class 1 through Class 3 Earth Fill, Crushed Limestone Base Material, and On-Site Soils shall not be less than 95 percent of maximum dry density as determined by ASTM D698, Standard Proctor. The in-place density of Class 4 and Class 5 Earth Fill shall not be less than 98 percent of maximum dry density as determined by ASTM D698, Standard Proctor. Compact the top 12 inches of fill underneath roadways and parking areas to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard Proctor. In areas cut underneath roadways and parking areas scarify and re-compact the top 8 inches of the subgrade within the specified moisture content, to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard Proctor.
5. Compact cohesionless materials, on which it is not practical to control the density by proctor methods, to a minimum of 95 percent of the maximum density as determined by ASTM D4253. At the discretion of the Engineer, an alternate method of determining the maximum density may be used which has been correlated with methods ASTM D4253 and ASTM D4254.
6. If necessary, to achieve the specified density, increase the number of passes of the compaction equipment, and/or modify the weight of the compaction equipment.
7. Regardless of the density achieved, the number of passes of the compaction equipment shall not be less than eight.

3.06 FIELD QUALITY CONTROL

- A. The Contractor is responsible for the costs involved in providing an approved testing laboratory to perform quality control testing of backfill operations. The testing laboratory shall make tests of in-place density in accordance with ASTM Standards. The testing laboratory shall monitor backfill operation continuously or at intervals acceptable to the Owner and Engineer at structures. It shall be the responsibility of the Contractor to notify the testing laboratory before backfill operations begin.
 - 1. Unless noted otherwise, in-place density tests shall be conducted at a rate of one test per 5,000 square feet for every lift, with a minimum of three tests for every lift.

END OF SECTION

31 23 23.34 FLOWABLE FILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to mix and place flowable fill, consisting of Portland cement, fine aggregate, fly ash, and water in the proper proportions as specified hereinafter. Flowable fill (Controlled Low-Strength Material, CLSM) shall be used to bed and backfill around piping, utilities, and structures where indicated.

1.02 QUALITY ASSURANCE

- A. Design Criteria – Flowable Fill Proportions and Consistency: Flowable fill shall be proportioned to give the necessary workability, strength, and consistency, and shall conform to the following governing requirements:
 - 1. Permeability: Maximum permeability limit of 1×10^{-6} cm/sec. This limit shall apply at all locations where flowable fill is used as a utility trench plug (dam) within trench backfill materials.
 - 1. Subsidence: Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per ft.) of flowable fill depth. Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C940.
 - 2. Strength for Excavatable Flowable Fill: Unconfined compressive strength at 28-days when tested in accordance with ASTM D4832: 100 psi (+/- 50 psi).
 - a. The 1-year strength shall not exceed 150 psi.
 - b. Where indicated provide Excavatable Flowable Fill around utilities, unless noted otherwise.
 - c. Excavatable Flowable Fill shall be excavatable with hand tools and conventional machinery such as backhoes.
 - 3. Strength for Non-Excavatable Flowable Fill: Unconfined compressive strength at 28-days when tested in accordance with ASTM D4832: 150 psi minimum.
 - a. Where indicated provide Non-Excavatable Flowable Fill below structures and/or around structures, unless noted otherwise.
 - 4. Fluidity: Flowable fill shall be self-consolidating and non-segregating in accordance with ASTM C1611:
 - a. Slump Flow Test: Minimum 20-inch mean spread.
 - b. Visual Stability Index (VSI) Test: Less than or equal to 1.
- B. Factory Testing: The Contractor shall be responsible for the design of the material. A trial mix shall be designed by an independent testing laboratory, retained by the Contractor. The testing laboratory shall submit verification that the materials and proportions of the trial mix design meets the requirement of the Specifications. In lieu of trial mix design, Contractor may submit historical data for a mix design used successfully in previous similar work. The Contractor shall not make changes in materials, either in gradation, source, or

brand, or proportions of the mixture after having been approved, except by specific approval of the Engineer.

- C. Owner Testing: It is the responsibility of the Contractor to achieve and maintain the quality of material required by this Section. However, the Owner may secure the services of an independent testing laboratory to verify the quality of the flowable fill. The Owner shall have the right to require additional testing, strengthening, or replacement of flowable fill which has failed to meet the minimum requirements of this Section.

1.03 SUBMITTALS

- A. Submit mix design on each material required. Provide backup data as required below.
- B. Submit historical or trial mix data and test results as a basis for mix design approval. Required data shall include:
1. Permeability test results if plugs are required on Project.
 2. Subsidence test results.
 3. Strength test results for Excavatable and Non-Excavatable Flowable Fill if used on Project.
 4. Fluidity test results.

1.04 STANDARDS AND REFERENCES

- A. Materials shall meet recommendation for mix design and placement, as published by National Ready Mixed Concrete Association.
- B. The applicable provisions of the following references and standards shall apply to this Section as if written herein in their entirety.
1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C150	Specification for Portland Cement
ASTM C618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as Mineral Admixture in Portland Cement Concrete
ASTM C940	Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C1611	Standard Test Method for Slump flow of Self Consolidating Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

2.00 PRODUCTS

2.01 MATERIALS

- A. Cement: Type I or I/II Portland cement conforming ASTM C150.

- B. Fine Aggregate: Fine aggregate consisting of natural, washed and screened sand having clean, hard, strong, durable, uncoated grains complying with the requirements for ASTM C33. The sand shall generally be of such size that all will pass a 3/8-inch sieve, at least 95 percent pass a 1/4-inch screen and at least 80 percent pass a No. 8 sieve. Aggregate shall not contain strong alkali, or organic material which gives a color darker than the standard color when tested in accordance with ASTM Specification Designation C40.
- C. Fly Ash/Pozzolans: Fly ash shall be an ASTM C618, Class C or F fly ash. The fly ash may be used in controlled low-strength material.
- D. Water: Water for flowable fill shall be clean and free from oil, acid, alkali, organic matter or other harmful impurities. Water which is suitable for drinking or for ordinary household use will be acceptable for concrete. Where available, water shall be obtained from mains of a waterworks system.
- E. Performance Additive: As required to meet specification requirements:
 - 1. Darafill by Grace Construction Products.
 - 2. Rheocell Rheofill by BASF The Chemical Company.
 - 3. Sika Lightcrete Powder by Sika Corporation.
 - 4. Approved equal.
- F. Chemical Admixtures for Concrete per ASTM C494, as required by performance requirements.

2.02 MIXES

- A. In the determination of the amount of water required for mix, consideration shall be given to the moisture content of the aggregate. The net amount of water in the mix will be the amount added at the mixer; plus the free water in the aggregate; and minus the absorption of the aggregate, based on a 30 minute absorption period. No water allowance shall be made for evaporation after batching.
- B. The methods of measurement of materials shall be such that the proportions of water to cement can be closely controlled during the progress of the Work and easily checked at any time by the Owner's representative. To avoid unnecessary or haphazard changes in consistency, the aggregate shall be obtained from sources which will insure a uniform quality and grading during any single day's operation and they shall be delivered to the Work and handled in such a manner that the variation in moisture content will not interfere with the steady production of flowable fill of reasonable degree of uniformity. Sources of supply shall be approved by the Owner's representative.
- C. All material shall be separately and accurately measured. Measurement may be made by weight or by volume, as determined by the Contractor; however, all equipment for measurement of materials shall be subject to approval by the Owner's representative.

3.00 EXECUTION

3.01 INSTALLATION

- A. Contractor shall give the Owner's representative sufficient advance notice before starting to place material in any area, to permit inspection of the area, and preparation for pouring.
- B. Conduct the operation of depositing the material so as to form a compact, dense, impervious mass, and so as not to develop air pockets in confined spaces.
- C. Unless specified otherwise, flowable fill shall be uniformly placed to the depth shown on the Drawings. The fill shall be brought up uniformly to the top of excavation elevation. Placement of flowable fill shall then cease and the fill protected from traffic for a period of 72 hours.
 - 1. To prevent pipe flotation place material in lifts or provide alternate means.
 - 2. Around structures, material shall be placed in lifts. Lift depth shall not exceed one-tenth of total structure embedment into subgrade nor 5 feet, whichever is less.
 - 3. When multiple lifts are required, material shall be allowed to harden before placing next lift. Hardening time varies with each mix. Verify flowable fill has reached a penetration number of 1500, in accordance with ASTM C403, but not less than 5 hours.
- D. The material shall be placed against undisturbed trench walls and shall not be placed on or against frozen ground.
- E. At time of placement the ambient temperature shall be 35 F and rising.

3.02 FIELD QUALITY CONTROL

- A. An approved testing laboratory shall perform the quality control testing of backfill operations. The testing laboratory shall sample material in accordance with ASTM D5971. The testing laboratory shall monitor backfill operation continuously or at intervals acceptable to the Owner and Engineer at structures. It shall be the responsibility of the Contractor to provide sufficient advance notification to the testing laboratory before backfill operations begin.
 - 1. Strength: A strength test is the average of two cylinders per ASTM D4832.
 - 2. Fluidity: A fluidity test is a Slump Flow Test and a VSI Test per ASTM C1611.
 - 3. For all tests required, at a minimum perform one test per day, but not less than one per 150 cubic yards.

END OF SECTION

31 23 33 TRENCHING AND BACKFILL [UTILITIES]

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to perform operations in trenching, pipe bedding, backfilling, clearing, grubbing and site preparation; handling, storage, transportation and disposal of excavated material; pumping and dewatering; preparation of subgrades; protection of adjacent property; fills, grading; and other appurtenant work. Trenching, backfilling, and pipe embedment procedures shall be in full compliance with Section 31 23 33.14 "Trench Safety." Earth removed from excavations and which is not required for backfill shall be removed from the Site by the Contractor at his own expense, unless arrangements are made with the Owner through his representative to allow disposal on Site. If permitted, the Contractor shall dump and spread excess earth in a manner agreed upon by the Contractor and the Owner. Excavations, other than trench excavation, are not part of this Section.

1.02 QUALITY ASSURANCE

- A. Classification:
 - 1. Excavations shall include material of whatever nature encountered, including but not limited to clays, sands, gravels, conglomeritic boulders, weathered clay shales, rock, debris and abandoned existing structures. Excavation and trenching shall include the removal and subsequent handling of materials excavated or otherwise handled in the performance of the Work.
 - 2. Bidders must satisfy themselves as to the actual existing subsurface conditions prior to the submittal of a proposal to complete the proposed Work.
 - 3. Trench excavation shall consist of excavation to the lines and grades indicated, required for installation of the pipe, pipe bedding, backfill, and to accommodate trench safety systems.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Sieve analysis on embedment materials.
 - 2. Test results indicating soil resistivity for embedment material used on metal pipe.
 - 3. Record Data: Certified test reports for compaction tests.

1.04 REFERENCE SPECIFICATIONS

- A. Section 01 33 00 "Document Management."
- B. Section 03 30 00 "Cast-In-Place Concrete."
- C. Section 31 23 23.34 "Flowable Fill"
- D. Section 31 23 33.14 "Trench Safety."

1.05 STANDARDS

A. The following publications, referred to hereafter by basic designation only, form a part of this Section to the extent indicated by the references thereto:

1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C125	Standard Terminology Relating to Concrete and Concrete Aggregates
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C535	Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D448	Standard Classification for Size of Aggregate for Road Bridge Construction
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-aggregate by Nuclear Methods (Shallow Depth)
ASTM G57	Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method

- B. Any other testing required by these specifications and not specifically referenced to a standard shall be performed under ASTM or other appropriate standards as designated by the Engineer.
- C. Reference herein or on the Drawings to soil classifications shall be understood to be according to ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.06 DELIVERY AND STORAGE

- A. Excavated materials to be used for backfill may be deposited in stockpiles at points convenient for rehandling the material during the backfilling process. The location of stockpiles shall be within the limits of construction easements or public right-of-way. The location of stockpiles is subject to the approval of the Owner or the Owner's representative. Keep drainage channels clear of stockpiled materials.

1.07 JOB CONDITIONS

- A. Place no embedment or backfill material during freezing weather or upon frozen subgrades or previously placed frozen embedment or backfill materials.

2.00 PRODUCTS

2.01 MATERIALS

- A. Concrete for Backfill, Blocking, Cradling and Encasement: Unless other strength requirements are designated, concrete used shall be 1500 psi as specified in Section 03 30 30 "Cast-In-Place Concrete."
- B. Class 1 Earth Fill: Limited to clays and sandy clays classified as CH material with a liquid limit greater than or equal to 50, a plasticity index greater than or equal to 25, and a minimum of 60 percent passing the No. 200 sieve, which are free of organic materials.
- C. Class 3 Earth Fill: Consist of any materials classified as CH, CL, SM, SP, SP-SM, SC, and GC, which have a minimum plasticity index of 4, which are free of organic materials.
- D. Class 12 Earth Fill: Consist of soils suitable for topsoil which are relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soils for topsoil shall be subject to the approval of the Engineer.
- E. Class 10 Aggregate Fill: Consists of washed and screened natural sands or sands manufactured by crushing stones complying with the requirements and tests of "Standard Specifications for Concrete Aggregates", ASTM C33. The gradation as included in ASTM C33 is as follows:

Sieve Size Square Opening	Percent Passing
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

- 1. Class 10 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.
- F. Cement: Type I Portland Cement.
- G. Flowable Fill: Flowable fill shall be in accordance with Section 31 23 23.34 "Flowable Fill."
- H. Modified Flowable Fill: Modified flowable backfill in areas of possible future excavation shall consist of a mixture of native soils or manufactured materials, cement and/or fly ash,

air entraining material and water which produces a material with unconfined compressive strength of between 250 and 450 psi after 28 days. Any materials used shall be primarily granular, with a plasticity index less than 12 and with 100 percent passing a 3/4-inch sieve. The flowable mixture shall be mixed in a pug mill, concrete mixer, or transit mixer and shall have a minimum slump of 5 inches. The flowable mixture must be allowed to set prior to the placement of any overlying materials. Modified flowable backfill in permanent areas such as abandoned pipe closures shall contain the same materials and have an unconfined compressive strength greater than 250 psi after 28 days.

- I. Tracer Wire: All piping shall be installed with a continuous, insulated TW, THW, THWN or HMWPE insulated copper, 10 gauge or thicker wire for pipeline location purposes by means of an electronic line tracer. The wire shall be installed along the entire length of pipe. The insulation color shall match the color of the pipe being installed. Sections of wire shall be spliced together using approved splice caps and water proof seals. Twisting the wires together is not acceptable.

2.02 MIXES; SAND-CEMENT BACKFILL

- A. A minimum sand and cement mixture of 25 parts sand and 2 parts cement will be required.
 1. Fine Sand: 25 Cubic Feet.
 2. Cement: 2 Bags (minimum).
 3. Water: Optimum moisture.
- B. Sand shall be free of any cohesive material and shall meet the following gradation and plasticity index requirements:

Sieve Size	Percent Passing
1"	100
1/2"	95-100
No. 40	80-100

- C. PI and LL Amounts:
 1. Plasticity Index: 10 Maximum.
 2. Liquid Limit: 25 or less.

3.00 EXECUTION

3.01 PREPARATION

- A. Site:
 1. Clear sites of logs, trees, roots, brush, tree trimmings and other objectionable materials and debris which are to be occupied by pipe trenches, and grub stumps. Designate material not salvaged for reuse as surface material as spoiled and dispose of material in accordance with Paragraph 3.01.E, Disposal of Spoil Material.
 2. Do not remove trees outside of the required working area unless their removal is authorized in writing by the Engineer and with the approval of the local governing

authority. Adequately protect the trees left standing from permanent damage by construction operations. Standing trees may be trimmed where necessary to facilitate construction, but only with written authorization from the Engineer.

B. Dewatering:

1. Provide and maintain adequate dewatering equipment to remove and dispose of surface and ground water entering the excavations, trenches, or other parts of the Work. Keep each excavation dry during subgrade preparation and continually thereafter until the proposed pipe is installed. Maintain the proper procedures necessary to protect against damage to the proposed Work from hydrostatic pressure, flotation, or other water related causes.
2. Dewater excavations which extend down to or below ground water elevation by lowering and keeping the ground water level a minimum of 2 feet below the bottom of the excavation.
3. Divert surface water or otherwise prevent water from entering excavated areas to the fullest extent possible without causing damage to adjacent property.
4. Provide and maintain any piping or conduit necessary to facilitate drainage. Do not alter area drainage patterns to the extent that adjacent property and landowners become threatened with localized flooding and/or water damage. Should such a situation occur, the Contractor shall be responsible for repairing the damage at no additional cost to the Owner.

C. Protection of Existing Structures and Utilities:

1. Prior to the start of construction, communicate with the representatives of the local utility companies, including the oil, gas, telephone and communications companies, and local water and sewer utilities operating in the location of the proposed construction area. Seek the utility companies' assistance in locating existing facilities to avoid conflicts during construction. The location, number, depth, and owner of utilities indicated are for information purposes only, and all utilities and structures may not be shown or may not be in the location shown.
2. Where construction endangers adjacent structures, utilities, embankments and/or roadways, the Contractor shall, at his own expense, carefully support and protect such structures so that no damage occurs throughout the construction process. In case damage should occur, the Contractor shall be responsible for restoring the damaged structure to a condition acceptable to the Owner of that structure and shall bear all cost of such reparations.
3. Repair or replace damaged street surfaces, driveways, sidewalks, curbs, gutters, fences, drainage structures, or other such facilities to the satisfaction of the Owner. Structures shall be returned to a condition equal to or better than the original condition and of same or better material and quality.

D. Blasting: Blasting shall not be allowed in any instance.

E. Disposal of Spoil Material:

1. Suitable material from excavations which meets the requirements for pipe backfill material as indicated, except stripping excavation, may be reused. Designate the

remaining excavated materials as spoiled material and dispose of material off the Site in accordance with all applicable laws, ordinances, and codes. Contractor shall be responsible for the storage, transportation, and deposition of spoiled material and shall be responsible for acquiring the necessary permits, and the payment of fees and duties at no additional cost to the Owner.

2. No burning of materials shall be permitted on the Site.

3.02 TRENCH EXCAVATION

- A. General: The trenches shall be excavated to the alignment and depth indicated or as necessary for the proper installation of the pipe and appurtenances. Brace and dewater the trench if necessary so that the workmen may work therein safely and efficiently. Any specific requirement listed in Paragraph 3.00, Execution, may be modified as necessary to meet OSHA requirements. However, if trench widths are wider than indicated, the Contractor shall be responsible for determining and furnishing the proper class of embedment and piping for the installation with no additional compensation to the Contractor.
- B. Trench Width: The trench widths shall be as shown on the Drawings.
- C. Pipe Foundation Subgrade:
 1. Excavate the trench to an even grade to permit the installation of the pipe so that the full length of the pipe barrel is supported on the proper depth of bedding material. The entire foundation subgrade area in the bottom of the excavations shall be firm, stable material, and the material shall not be disturbed below required grade except as described in this Section. Where the character of the subgrade material is such that proper subgrade cannot be obtained at the elevation indicated, deepen the excavation to a satisfactory subgrade material.
 2. Remove the material until a firm, stable, and uniform bearing is reached and the subgrade brought back to the required grade with the specified bedding material compacted in place or with lean concrete material. The expense of replacing any unsatisfactory subgrade shall be borne by the Contractor.
- D. Correcting Faulty Grade: Should any part of the trench be excavated below required grade, correct the trench with bedding material, thoroughly compacted, or with lean concrete, at no additional compensation to the Contractor.
- E. Care of Surface Material for Reuse: If local conditions permit reuse, keep surface material suitable for reuse separate from the general excavation material.
- F. Trenching Methods: The use of any suitable trench digging machinery is permitted except in places where such operations may cause damage, above or below ground, in which case, employ hand methods.
- G. Pipe Clearance in Rock: Remove ledge rock, rock fragments, shale, or other rock to provide proper clearance for bedding materials. Provide adequate clearance for properly jointing pipe laid in rock trenches at bell holes.

3.03 BACKFILL

A. Bedding within Pipe Zone:

1. Concrete Cradle, Encasement or Concrete Arch: Where indicated, install the pipe in concrete cradle, encasement, or concrete arch. Take precautions to prevent pipe movement or deflection during construction. Where pipes are placed below structures, completely encase pipes in 1500 psi concrete, and extend up to bottom of structure.
2. Concrete Blocking: Place blocking to rest against firm undisturbed trench walls. The supporting area for each block shall be at least as great as that indicated and shall be sufficient to withstand the thrust, including water hammer, which may develop. Each block shall rest on a firm undisturbed foundation of trench sides and bottom.

B. Aggregate Fill Bedding:

1. After the trench has been cut to the depths indicated bring up the bedding layer to a point slightly above grade in maximum 4-inch lifts and uniformly compact to the density indicated. Form bell holes and scoop out a trough to grade so that the pipe is uniformly supported by the embedment material. Lay and joint the pipe. Bring up the embedment material in maximum 4-inch lifts on either side of the pipe to the elevation above the pipe shown on the Drawings. Uniformly compact the pipe as indicated.
2. After moisture is gone from the embedment material, place utility detection tape and backfill and compact the remaining backfill by tamping or other appropriate methods. Water jetting shall not be permitted.
3. Install utility detection tape and tracer wire.

C. Compaction Requirements:

1. Compact earth fill and cohesive aggregate fill in maximum 4-inch lifts with pneumatic rollers or power hand tampers and make a minimum of eight passes.
2. Compact cohesionless aggregate fill in maximum 4-inch lifts with vibratory rollers or vibratory plate power hand compactors and make a minimum of eight passes.
3. The acceptability of the compaction equipment shall be based upon the results of a test section. Compact earth fill and cohesive aggregate fill to a minimum of 95 percent of maximum dry density as determined by ASTM D698, Standard Proctor.
4. Compact Class 1 and 2 earth fill at a moisture content within minus 0 to plus 5 percentage points of the optimum moisture content. Compact the remaining classes of earth fill and cohesive aggregate fill at a moisture content within minus 2 to plus 5 percentage points of optimum moisture content. The moisture ranges listed above are minimum and maximum limits. A tighter moisture range within these limits may be required to consistently achieve the specified density.
5. Compact cohesionless aggregate fill on which it is not practical to control the density by "Proctor" methods to a minimum of 75 percent relative density as determined by ASTM D4253 and D 4254, or at the discretion of the Engineer, by a field compaction mold method correlated to ASTM D4253 and D 4254.
6. Compact cohesionless aggregate fill at a moisture content within a range that accommodates consistent placement and compaction to the minimum relative density specified above.

7. The Owner will arrange and pay for density and moisture testing. The testing frequency and methods shall be as requested by the Engineer. The Engineer may waive testing requirements on cohesionless bedding where testing is not practical because of limited space between the pipe and trench walls, however, the minimum number of passes of the compaction equipment specified above shall be achieved.

3.04 FINISHING

- A. Grade and rake areas smooth and even which do not receive any type of paved surface, to allow drainage to drain away from the structures and toward the roads and streets or the natural drainage course. Break up large clods of earth and remove rocks, trash or debris near the surface.
- B. Finish the top portion of backfill beneath established sodded (lawn) areas with not less than 6 inches of topsoil corresponding to, or better than, that underlying adjoining sodded areas.

3.05 FIELD QUALITY CONTROL

- A. Compact backfill and appropriate embedment material to a minimum of 95 percent of maximum density at a moisture content of 0 to plus 5 percent of optimum for backfill and at optimum for sand-cement embedment as determined by ASTM D698, Standard Proctor.
- B. Make periodic tests of compaction for conformance with this Section by an approved testing laboratory selected and paid for by the Owner. Contractor shall pay for re-testing until acceptable test results are obtained.

3.06 CLEAN AND ADJUST

- A. Remove surplus pipeline materials, tools, rubbish and temporary structures and leave the construction site clean, to the satisfaction of the Engineer.

END OF SECTION

31 23 33.14 TRENCH SAFETY

1.00 GENERAL

1.01 WORK INCLUDED

- A. This specification consists of the basic requirements which the Contractor must comply with in order to provide for the safety and health of workers in a trench. This specification is for the purpose of providing minimum performance specifications, and the Contractor shall develop, design, and implement the trench safety system. The Contractor shall bear the sole responsibility for the adequacy of the trench safety system and providing “a safe place to work” for the workman.
- B. Should the trench safety protection system require wider trenches than specified elsewhere, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, as well as, purchase and installation of alternate materials.

1.02 STANDARDS

- A. The following standard shall be the minimum governing requirement of this specification and is hereby made a part of this specification as if written in its entirety.
 - 1. Occupational Safety and Health Standards - Excavations (29CFR Part 1926), U.S. Department of Labor, latest edition.
- B. Comply with the applicable federal, state, and local rules, regulations, and ordinances.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

33 01 02 PIPING SPECIALTIES

1.00 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor and materials required and installed complete and ready for operation, all appurtenances as shown on the Drawings or as specified.
- B. The appurtenances shall include, but not be limited to the following: (Note: All items listed below may not be required in this Contract).
 - 1. Mechanical Type Wall Seals
 - 2. Service Clamps
 - 3. Dielectric Insulating Gasket Kits for Flanges
 - 4. Harnessing and Restraint
 - 5. Sleeve Couplings (Dresser type)
 - 6. Flanged Coupling Adapters
 - 7. Quick Connect Couplings
 - 8. Expansion/Vibration Joints (Fittings)
 - 9. Modular Mechanical Expanding Rubber Seals
 - 10. Pipe Supports
 - 11. Floor Drains
 - 12. Wall and Floor Fittings
 - 13. Gauges and Accessories
 - 14. Valve Operators
 - 15. Strainers
 - 16. Corporation Stops
 - 17. Flexible Chemical Carrier Tubing
 - 18. Insulation for Process Piping
 - 19. Appurtenances and Miscellaneous Items
 - 20. Pipe Coupling
 - 21. Copper Pipe and Fittings
 - 22. Fiberglass Reinforced Pipe and Fittings
 - 23. Emergency Eyewash/Shower

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 02 "Shop Drawings". They shall show as a minimum all details and materials of construction and dimensions.
- B. Submit operating and maintenance instruction in compliance with Section 01 33 04 "Operation and Maintenance Data."

1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI): ANSI B2.1.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM A 183 - Specification for Carbon Steel Track Bolts and Nuts.
 - 3. ASTM A 278 - Specification for Gray Iron Castings for Pressure Containing Parts for Temperatures Up to 650 degrees F.
 - 4. ASTM B 62 - Specification for Composition Bronze or Ounce Metal Castings.
 - 5. ASTM B 88 - Specification for Seamless Copper Water Tube.
 - 6. ASTM A 536 - Specification for Ductile Iron Castings.
- C. American Water Works Association (AWWA): AWWA C 606 - Grooved and Shouldered Joints.
- D. Federal Specifications (F.S.): MIL-C-27487.

1.04 QUALITY ASSURANCE

- A. Items listed herein shall be products of manufacturers who have a minimum of five (5) years' experience in the manufacture of the particular equipment item to be furnished.

1.05 GUARANTEE AND WARRANTY

- A. The Manufacturer shall warrant the equipment furnished under this specification for a minimum period of one (1) year against defects in materials and workmanship, and operational failure.
- B. In the event of a defect in material or workmanship or equipment design of any part or parts of the equipment during the first one (1) year of service, the Valve Manufacturer shall furnish, deliver, and replace the defective part or parts at Manufacturer's expense.
- C. The first one (1) year of service shall be defined as the 12-month period following the installation, adjusting, or 24 months after delivery, whichever occurs first.

2.00 PRODUCTS

2.01 GENERAL

- A. Joint, size and material - unless otherwise noted or required by the Owner:
 - 1. Joints referred to herein shall be of the same nominal diameter as the pipe or fittings they are connected to.
 - 2. Appurtenance shall be of the same nominal diameter as the pipe or fittings they are connected to.
 - 3. All mechanical couplings, flange adapters, restraint harness, etc. exposed to wastewater and/or corrosive environment shall be supplied with 304L SS hardware.
- B. Insure that valves and appurtenances have ends/joints that are compatible with, and may be fastened to the adjoining pipe. This may mean furnishing special adaptors as required. These adaptors shall be suitable for direct bury, with proper dielectric insulation and as a minimum, if metallic non-stainless steel or galvanized, coated with two coats of Coal Tar Epoxy.

2.02 MECHANICAL TYPE WALL SEALS

- A. Mechanical type seals shall consist of an adjustable modular bolted, synthetic rubber and plastic sealing element as shown on Drawings. The sealing element shall be Link-Seal LS-300-C as manufactured by Enpro Industries., or equal. Associated hardware shall be 304L SS.

2.03 SERVICE CLAMPS

- A. Service clamps shall have malleable or ductile iron bodies which extend at least 360 degrees around the circumference of the pipe and shall have neoprene gaskets cemented to the saddle body. Bodies shall be tapped for IPS. Clamps shall be of the double strap design.
- B. Service clamps shall be IPS service clamps as manufactured by Mueller Co., or equal.

2.04 DIELECTRIC INSULATING GASKET KITS FOR FLANGES

- A. Dielectric insulating flange gasket kits shall be installed when dissimilar metal pipe connects to prevent galvanic action. Flange insulation kits shall be installed where a stainless steel flange is mated with flanges constructed of bronze alloys, carbon steel alloys, or nickel alloys (Monel, Hastelloy and Inconel) flanges; where process piping mates with valves and other equipment and appurtenances of dissimilar metals; where exposed piping makes a vertical transition to buried piping; and where otherwise as shown on the Drawings.
- B. Insulating flange gaskets shall be furnished as a kit including the dielectric gasket, bolt sleeves and washers in accordance to the nominal flange size.

- C. Each dielectric insulating gasket shall be a full face isolating and sealing gasket, Type "E", 1/8" thick, epoxy-glass retainer with bolt holes cut to match matting flange drilling. The retainer shall contain a precision tapered groove to accommodate the controlled compression of a FKM (Viton) sealing element. The quad-ring seal shall be pressure energized. The epoxy-glass retainer shall have 550-volts/mil dielectric strength and a minimum 50,000 psi compressive strength.
- D. Insulating bolt-sleeves shall be manufactured of Mylar having a dielectric strength of not less than 4000-volts/mil.
- E. Insulating washers shall be manufactured of G-10 epoxy-glass having a dielectric strength of 400 to 500-volts/mil. Insulating washers shall be installed with metallic backing washers to prevent damage to the epox-glass washers during bolting. The metallic washers shall be constructed of the same material as the bolts.
- F. Dielectric insulating flange gasket kits shall be:
 - 1. Linebacker manufactured by Pipeline Seal and Insulator, Houston, Texas.
 - 2. Trojan Quad Seal manufactured by Advance Products and Systems, Lafayette, Louisiana.
 - 3. Jack O-ring gaskets manufactured by Central Plastics, Shawnee, Oklahoma.

2.05 HARNESSING AND RESTRAINT

- A. Unless otherwise noted, size and material for tie rods, clamps, plates, and hex nuts shall be as shown on the Drawings, or in the AWWA Manual M-11. Manufactured restraining clamp assemblies shall be as manufactured by Stellar Corporation or fabricated equal.
- B. All flexible couplings and flanged coupling adaptors shall be harnessed. Harnesses shall conform to AWWA Manual M-11 except as modified by the Drawings or this specification.
- C. Restrained joints (such as welded, locking mechanical joints) shall be of the type specified with the individual type of pipe. If not specified, restrained (locking) mechanical joint pipe shall be of the manufactures standard design utilizing a locking device (ring or ears) integrally cast with the pipe.
- D. For up through 18-inch diameter ductile iron pipe only the following may be used as an alternative to other restraint system:
 - 1. The optional mechanical joint restraints shall be incorporated in the design of a follower gland. The gland shall be manufactured of ductile iron conforming to ASTM A 536. Dimensions of the gland shall be such that it can be used with standard mechanical joint bell and tee-head bolts as specified with the pipe.
 - 2. The restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. Gripping surfaces on the pipe shall be wedges designed to spread the bearing surfaces on the pipe. Twist-off nuts, sized same as tee-head bolts, and shall be used to insure proper actuating of restraining devices. When the nut is sheared off, standard hex nut shall remain.

3. The mechanical joint restraint device for ductile iron pipe shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.
 4. Mechanical joint restraint devices shall be of the type listed below or equal. For Ductile Iron Pipe: Flex Ring or Lock Ring by American Ductile Iron Pipe.
- E. The Contractor shall be responsible for anchorage including restraint as noted in elsewhere in Division 33.
- F. Restrained flange adapters shall be used in lieu of threaded or welded flanged spool pieces or at locations where dimensional constraints exist. Flanged adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10 (125#/Class 150 Bolt Pattern).

Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.

The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6-inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

All internal surfaces of the gasket ring (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61. Exterior surfaces of the gasket ring shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

The flange adapter shall be the Series 2100 MEGAFLANGE® Restrained Flange Adapter as produced by EBAA Iron, Inc. or equal.

2.06 SLEEVE TYPE COUPLING ("DRESSER TYPE")

- A. Unless otherwise specified with the individual type of pipe, sleeve type couplings ("Dresser" type) shall be for buried pipe applications ITT (Smith Blair) Style 411, Dresser Style 38, Romac Style 400, or equal. Carbon steel or ductile iron construction with fusion bonded epoxy finish and Type 304 stainless steel hardware. If restrained couplings are indicated, use Romac Style 400RG couplings or equal.

2.07 FLANGE COUPLING ADAPTORS

- A. Ductile iron or carbon steel construction with fusion bonded epoxy coating and Type 316 Stainless steel hardware, specifically designed for use with the type of pipe proposed. Furnish Dresser Style 128, Smith-Blair 911, Romac FCG, or equal by Smith-Blair. For restrained flange coupling adapters furnish Smith-Blair 911, Romac RFCA, or equal.

2.08 QUICK CONNECT COUPLINGS

- A. Couplings shall be of the cam and groove type consisting of a male adapter and female receiver. Male adapters shall be designed to receive a female coupler without requiring

threading, bolting, or tools. Male end with NPT pipe connection. Connections shall remain tight and leakproof under pressures up to 100 psi at 0-degrees F. Each adapter shall be furnished with a dust cap complete with an 18-inch long security chain of corrosion resistant material. Polypropylene construction and Type 316 stainless steel hardware and chain. Couplings shall be Cam Lever Couplings by Banjo Corporation, Poly ProQuick by Industrial Thermoplastic Solutions, Ever-tite by Morris Coupling Company, or equal.

- B. Adapters shall be furnished in accordance with the Drawings or as required by the installation.

2.09 METAL BELLOW EXPANSION JOINTS

- A. Metal expansion joints shall consist of a single hydraulically formed metal bellows with flange end fittings. Flanges shall be 304L stainless steel and ANSI 150 lb. The bellows shall be of a 304L stainless steel. Joints shall be constructed to pipe size and to meet working pressure up to 25 psi and corrosive conditions.
- B. Expansion joints shall be rated for temperatures of up to 250°F and shall be capable of accommodating piping expansion up to 3" and contraction up to 1.5" and equipment movements as needed.
- C. Tie rods shall be included to prevent overextension of the expansion joints from pressure thrust loads. The number and size of the control rods shall be sufficient for the maximum system test pressure.
- D. Expansion joints shall be as manufactured by Hyspan, Metraflex, or equal.

2.10 MODULAR MECHANICAL EXPANDING RUBBER SEAL

- A. The pipe to existing wall penetration closures shall be "Link-Seal" as manufactured by GPT EnPro or equal. Seals shall be modular mechanical type, consisting of interlocking EPDM links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with stainless steel hardware to form a continuous rubber belt around the pipe with a composite pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall, thus reducing chances of cathodic reaction between these two members.

2.11 PIPE SUPPORTS

- A. Adjustable pipe supports under valves and piping shall be Anvil International Figure 264 or equal, comprising cast iron saddle, threaded nipple, and reducer assembly with extra strength steel pipe and floor flange, if applicable. Provide supports with shop-primed epoxy compatible finish. For special sizes and shapes of valves, saddle shall be fabricated steel to fit valve or piping being supported.

2.12 FLOOR DRAINS

- A. Floor drains shall be cast iron of the sizes indicated. Floor drains shall have a float type backwater valve with cast iron housing, plastic ball valve, renewable rubber seat, brass seat ring, and brass wire valve cage for installation in the floor drain threaded outlet. Drain design shall allow height adjustment prior to concrete slab placement. Floor drains shall be Series 30000-A and backwater valve shall be Series 67100A as manufactured by JOSAM Manufacturing Co. or equal.

2.13 WALL AND FLOOR FITTINGS

- A. Wall and floor castings, unless otherwise specified with the individual type of pipe, shall be ductile iron of the style shown on the Drawings with integral exterior water stop, standard models as manufactured by American Cast Iron Pipe Company, Clow, U.S. Pipe, or equal.
- B. For plastic pipe or other pipe 2-1/2 inch diameter or less wall and floor fittings shall be ASTM A120, Schedule 40 steel sleeves with exterior steel water stop, all hot dipped galvanized after fabrication.

2.14 GAUGES AND ACCESSORIES

- A. Pressure gauges: All gauges unless otherwise noted be liquid filled, 316 stainless steel case and shall have 3-1/2 inch diameter face, with black letters on a white background, with pressure range as indicated on the drawings. Ashcroft Model 1009SW or equal by Robert Shaw or Ametek U.S. Gauge or Acragage.
- B. Diaphragm Seal (for waste water applications): Type 316 stainless steel housing and diaphragm with threaded connections and flushing connection. Ashcroft Model 101 or equal by Ametek or Acragage.
- C. Pressure Snubber: Stainless steel construction, threaded. Ashcroft Model 1112 or equal.
- D. Ball valves: Type 316 body, ball and stem with removable lever handle, NPT threaded connections, rated for 250 psi minimum. SVF Flow Controls Series R8 or equal by Jamesbury or Contromatic Circor.
- E. Pipe or Tubing – Schedule 40 Stainless Steel.

2.15 VALVE OPERATORS (INCLUDING FLOOR BOXES)

- A. The valve manufacturer shall supply and integrally mount all operators on valves at the factory. The valves and their individual operators shall be shipped as a unit.
- B. Unless otherwise noted, valves shall be manually operated; non-buried valves shall have an operating wheel, handle or lever mounted on the operator; buried valves shall have a non-rising stem with an AWWA 2-inch nut.
- C. Unless otherwise required by the Owner, all manual operating input shafts shall turn to the left (counter-clockwise) to open the valve.
- D. Each operating device shall have cast on it the word (OPEN) and an arrow indicating the direction of operation.

- E. Floor boxes for operating nuts recessed in concrete floors shall be standard cast iron type, cast-in-place with fastening top.
- F. Chain wheel operators shall be supplied for all valves: Valves larger than 3 inch in diameter whose centerline is 8 ft. or more above the floor, where required for accessibility of valve operator, or as indicated on the Drawings. Chains shall be galvanized and loop within four feet of the floor.
- G. Unless otherwise noted, gear operators shall be provided for: All valves with operating shafts of larger than 8 inch nominal diameter (unless otherwise noted); for all buried valves with their operating shaft mounted horizontally (butterfly, plug, etc.); where specified and/or indicated on the Drawings; where manual operator effort is greater than 40 ft-lbs. Gear operators shall normally be of the beveled type with output shaft perpendicular to valve shaft, having a removable handwheel mounted on the output shaft. Gearing shall be machine-cut steel designed for smooth operator. Bearings shall be permanently lubricated, provided to take all thrusts and seals provided to contain lubricants. Housings shall exclude moisture and dirt. Manual operator input effort to the handwheel shall be a maximum of 40 ft-lbs. for operator the valve from full open to full close, under line pressure. Gear operators shall indicate valve position and have adjustable stops.

2.16 STRAINERS

- A. "Y" Type Strainers:
 - 1. Manual strainers furnished for pipe diameters smaller than 2 inches in diameter shall be "Y" type, capable of removing solids 0.01 inches diameter and larger. The strainer body shall be of semi-steel construction for steel pipe, and brass or bronze for copper pipe and shall conform to ASTM A278, Class 30. Strainers on plastic pipe shall be of the same material as the pipe. Strainer elements, including woven wire mesh, shall be constructed of stainless steel.
 - 2. Design of the strainer body shall be such that the clean-out plug and screw may be easily removed to permit inspection and cleaning without disassembly of inlet and outlet piping. End connections shall be ANSI screwed pipe threads.
 - 3. Sufficient spare screens shall be furnished for replacement of all "Y" type units at least once. Strainers shall be designed for a maximum operating pressure of 150 psig. They shall be as manufactured by GA Industries, Inc., or equal.

2.17 CORPORATION STOPS

- A. Corporation stops shall be of bronze or brass, and shall be designed and manufactured in accordance with AWWA Standard C800, except as modified herein. Corporation stops shall have Mueller inlet threads, except that corporation stops for use with service clamps shall have IPS threads. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on the outlet of each corporation stop.

2.18 FLEXIBLE CHEMICAL CARRIER TUBING

- A. Braided clear PVC flexible tubing with a minimum working pressure 140 psi (pressure rating must be printed on tubing). For fittings, use PVC or polypropylene barbed connectors with stainless steel hose clamps.
- B. Manufacturers: Finger Lake Extrusions BraidFLEX 70N, Saint-Gobian Tygon B-44-4X, Thermoplastic Processes Excelon Braided, New Age Industries Nylobrade, or equal.

2.19 INSULATION FOR PROCESS PIPING

A. Air (ALP) Piping Service

- 1. Insulation: Minimum 3-inch thick, ASTM C335 K-Value minimum of 0.24 at 75 degrees F. Maximum moisture absorption: 0.2 percent by volume. Service temperature range of 0 degrees F to 850 degrees F.
- 2. Vapor Retarder: White Kraft paper reinforced with glass fiber yarn and bonded to aluminized film. Moisture vapor transmission - ASTM E96, 0.02 perm inches. Secure paper with self-sealing, longitudinal laps and butt strips.
- 3. Metal Jacket: Aluminum, ASTM B209.
- 4. Manufacturers: Owens Corning Fiberglas FlexWrap, Johns Manville, Knauf Fiber Glass Pipe Insulation, or equal.

B. Liquid Process Piping Service

- 1. Insulation shall be heavy density sectional pipe insulation slip-on tubes. Minimum insulation density shall be six pounds per cubic foot. Water absorption shall not exceed 1.0% by volume and 10.0% by weight. Water vapor permeability shall not exceed 0.20. Mildew resistance shall allow no fungal growth after 90 days incubation. Flame spread shall not exceed 35 and smoke density shall not exceed 100 per ASTM E-84. Contractor shall use manufacturer's recommended methods for jointing material. Minimum insulation thickness shall be 1½ inches. Piping insulation shall be Rubatex or equal.
- 2. Insulation fitting covers and jackets:
 - a. Interior fitting covers shall fit snugly over fittings, including all elbows and valves, etc. Jacketing shall be high impact UV resistant covering for insulated piping and shall match fitting covers. Fitting covers and jackets shall be white and suitable for painting. PVC jacketing shall be 30 mil thick and shall be factory curled to fit snugly. Fitting covers and jacketing shall be secured with tacks. Interior insulation fitting covers shall be Zeston 2000 PVC by Manville, or equal.
 - b. Exterior aluminum Jacketing shall conform to ASTM B209, and shall have a thickness of 0.032 inch sheet. The joining shall be longitudinal slip joints and have 2 inch laps. Fittings shall be 0.016 inch thick die-shaped fitting covers with factory-attached protective liner. Metal jacket bands shall be 3/8 inch wide and comprised of 0.010 inch thick stainless steel. Finish shall be embossed. Exterior insulation fitting covers shall be Childers Metals, or equal

3. Mastic Coating for Fittings: Fire-resistant, mastic coating for insulation on fittings and reinforced fiberglass cloth. Color: Metallic Gray.
4. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for the applications indicated.

2.20 APPURTENANCES AND MISCELLANEOUS ITEMS

- A. Gaskets, glands, bolts, nuts, and other required hardware shall be provided for connection of piping and appurtenances. Bolts and nuts shall be high strength, Type 304 stainless steel if submerged, buried, exposed to element, in vaults or subject to splashing, or corrosive environment. All other bolts, nuts, and studs shall conform to ASTM A307 Grade B. Gaskets for flanges shall be full face and suitable for 200 degrees F operating temperature, unless higher temperature required on individual systems.
- B. Plugs, caps and similar accessories shall be of the same material as the pipe, and of the locking type, unless otherwise noted.
- C. Unions shall be of the same material as the pipe.
- D. Special dielectric protective tape shall be fabric reinforced petroleum tape as manufactured by Denso, Inc., or equal.

2.21 PIPE COUPLINGS

- A. Dresser style pipe couplings where shown on the Plans shall be Dresser Industries or approved equal, for same pressure rating as adjoining pipe. Couplings shall comprise a steel center band, steel gland rings, gaskets, and bolts. Provide thrust harness in accordance with AWWA Manual M11 where shown on the Plans.
- B. Victaulic style couplings shall be in accordance with AWWA C606. Pipe shall have shouldered or collared ends for positive thrust anchorage.
- C. Split-sleeve mechanical couplings shall consist of housing, gasket assembly, bolts and nuts, and end rings as required for restraint. Couplings shall be Depend-O-Lok as manufactured by Brico Industries, Inc., or an approved equal. Coupling housing shall be manufactured from ASTM A36 Carbon Steel. Couplings installed underground shall receive a Bitumastic coating.
- D. Where Victaulic couplings or restrained Dresser type couplings are shown on the Drawings for water service pipes, split-sleeve "F by F" type couplings will be allowed, provided the split-sleeve coupling is suitable for the pressures and thrust requirements, and fits in the space available for coupling. Where unrestrained Dresser couplings are shown, split-sleeve "F by E" type couplings will be allowed.

2.22 COPPER PIPE AND FITTINGS

- A. Copper pipe for water service shall be Type "K" hard-drawn copper tubing. Connections shall be made using cast brass or copper sweat fittings and Sil-Fos or approved equal hard solder. Union adaptors shall be used at ends of copper lines and at connections to equipment so that piping can be disconnected without unsoldering the joints.

- B. Joints in copper piping shall be soldered with ANSI/ASME B32, Grade 95TA solder. Before making up joints, copper shall be cleaned to bright metal with emery cloth and treated with nonacid type flux.

2.23 FIBERGLASS REINFORCED PIPE AND FITTINGS

- A. Reinforced Fiberglass Pipe shall conform to the requirements of ASTM D2997 and ASTM D2310. Pipe shall meet or exceed the requirements for Type 2, Grade 1, Class "C" pipe and have a 60-mil resin-rich liner. Minimum wall thickness shall not be less than 0.2 inch.
- B. Fittings shall conform to or exceed the requirements of the pipe and shall be produced from epoxy resin.
- C. Connections shall be flanged. Gasket material shall be of an elastomer which shall provide chemical resistance for the service required. Gasket material shall be 3/16-inch thick, full-faced design, with a Durometer Shore "A" reading of 40-60 and shall be BUNA-N, Neoprene, Viton, Hypalon, or approved equal.
- D. The reinforced fiberglass pipe, fittings, and gaskets shall be capable of handling water temperatures up to 250 degrees and water pressures up to 300 psi.

2.24 EMERGENCY EYEWASH/SHOWER

- A. Furnish and install combination eyewash/shower emergency unit, connecting piping and drain. Unit shall comply with OSHA regulations and ANSI standards. Each unit shall be freeze-proof and capable of operating at temperatures as low as 10 F. 10-inch deluge shower head and twin-face-wash spray unit shall be individually operated and instant-action. Water supply shall be buried. Unit shall be Haws Model 8300FP, or approved equal.

3.00 EXECUTION

3.01 INSTALLATION GENERAL

- A. Items shall be installed per Manufacturer's instructions in the locations shown. Damage to items shall be repaired to the satisfaction of the Owner before they are installed.
- B. Install brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting items, check Drawings which have a direct bearing on their location to be responsible for the proper location of these appurtenances during construction of structures.
- C. Items shall be carefully inspected for defects in construction and materials; debris and foreign material cleaned out of openings, etc.; operating mechanisms operated to check their proper functioning, and nuts and bolts checked for tightness. Equipment which does not operate easily, or is otherwise defective, shall be repaired or replaced.

- D. Where installation is covered by a referenced Standard Specification, installation shall be in accordance with that Specification, except as herein modified.
- E. Unless otherwise noted, joints for items shall be made up utilizing the same procedures as specified under the applicable type connecting pipe joint.

3.02 INSTALLATION OF SLEEVE (DRESSER) TYPE COUPLINGS

- A. Unless otherwise required by the manufacturer's instructions, prior to installation of sleeve-type couplings, pipe ends shall be cleaned thoroughly for a distance of at least 12 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, the middle ring shall be placed on the already installed pipe and shall be inserted into the middle ring flair and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
- B. After the bolts have been inserted and nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened around the joint, by use of a torque wrench of the appropriate size and torque for the bolts.
- C. The correct torque as indicated by a torque wrench shall not exceed 75 ft-lb for 5/8 inch bolts and 90 ft-lb for 3/4 inch bolts.
- D. If a wrench other than a torque wrench is used, it should be no longer than 12 inches so that when used by the average person the above torque values shall not be exceeded.
- E. To prevent sleeve-type couplings from pulling apart under pressure, a suitable harnessing or flange clamp assembly shall be provided and installed where shown on the Drawings, or required elsewhere under Division 15 concerning Anchorage.
- F. Note the additional locations required for sleeve couplings per Part 2 of this Section.

3.03 FLANGED COUPLINGS ADAPTERS

- A. Flanged coupling adapters shall be installed in strict accordance with the coupling manufacturer's recommendations. After the pipe is in place and bolted tight, the proper locations of holes for the anchor studs shall be determined and the pipe shall be field-filled. Holes for anchor studs shall be drilled completely through the wall pipe. Hole diameter shall not be more than 1/8 inch larger than the diameter of the stud projection.
- B. The inner surface of couplings shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining surfaces, except flange mating surfaces, shall be cleaned and shop primed with universal primer.

3.04 INSTALLATION OF EXPANSION/VIBRATION ISOLATION FITTINGS

- A. Piping systems shall be aligned prior to installation of expansion fittings. Alignment shall be provided by fitting a rigid pipe spool in place of the expansion joint. Prior to testing of the piping system, the pipe spool shall be replaced with the specified expansion fitting.

- B. In addition to the locations noted on the Drawings, and in Part 2 of this Section, expansion fittings and anchors shall be located and spaced as specified by the Expansion Joint Manufacturer's Association under ambient conditions. They shall not be installed during times of temperature extreme or in a fully compressed or fully expanded condition.
- C. Manufacturer shall provide field representative during installation of expansion joints.
- D. Manufacturer's field representative shall certify installation of expansion joints.

3.05 INSTALLATION OF WALL AND FLOOR FITTINGS

- A. Wall pipes and pipe sleeves embedded in concrete walls, floors, and slabs shall be embedded as shown. Support all pipes embedded in concrete walls, floors, and slabs with form work to prevent contact with the reinforcing steel.

3.06 INSTALLATION OF OTHER EQUIPMENT, APPURTENANCES AND MISCELLANEOUS ITEMS

- A. Unions and wall fitting shall be installed as indicated on the Drawings.
- B. Hardware and appurtenances shall be installed as required and in accordance with the Manufacturer's recommendations, as acceptable to the Owner.
- C. Use teflon tape on screwed fittings.

3.07 FIELD PAINTING

- A. Field painting is specified in Division 09. Buried metal items or those in vaults shall receive two coats of coal tar epoxy. The total DFT shall be 16 to 20 mils.

END OF SECTION

33 05 01.09 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install polyvinyl chloride (PVC) pressure pipe, appurtenances, and fittings to the diameters indicated for water supply and wastewater pressure piping. Trenching, backfilling, and pipe embedment shall be in accordance with Section 31 23 33 "Trenching and Backfill [Utilities]."

1.02 QUALITY ASSURANCE

- A. Certification: Domestic water piping shall be approved by the Underwriters Laboratory and shall be accepted by the State Fire Insurance Commission for use in water distribution systems. PVC water pipe shall bear the seal of approval (or "NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.
- B. Design Criteria: The maximum allowable load for PVC pipe installations shall produce a maximum deflection of 4 percent.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Certified Test Reports from the Manufacturer's testing facility or an approved testing laboratory.
 - 2. Shop Drawing including the following information:
 - a. Manufacturer.
 - b. Dimension ratio.
 - c. Joint types.
 - d. Gaskets material.
 - e. Manufacturer's recommendation for maximum deflected joint angle and minimum longitudinal bending radius

1.04 REFERENCE SPECIFICATIONS

- A. Section 01 33 00 "Document Management."
- B. Section 01 40 00 "Quality Management."
- C. Section 33 10 13 "Disinfecting of Water Utility Distribution."
- D. Section 31 23 33 "Trenching and Backfill [Utilities]."

1.05 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety. PVC piping and fittings shall be in full compliance with the applicable standards

and specifications for each type of plastic pipe involved. Pipe may be rejected for failure to comply with any requirement of this Section.

1. American Society for Testing and Materials (ASTM) Standards:

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated PVC Pipe (SDR) Series
ASTM D2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings Schedule 40
ASTM D2467	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F1674	Standard Test Method for Joint Restraint Products for Use with PVC Pipe

2. American Water Works Association (AWWA) Standards:

AWWA C104	Cement-Mortar Lining for Ductile Iron Pipe and Fittings
AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C153	Ductile-Iron Compact Fittings
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA C900	Poly Vinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 through 60 Inches (100 mm Through 1,500 mm)
AWWA M23	PVC Pipe – Design and Installation.
AWWA M41	Ductile – Iron Pipe and Fittings

3. NSF International (NSF):

NSF 61	Drinking Water System Components – Health Effects
--------	---

4. Underwriters Laboratories, Inc. (UL).

1.06 DELIVERY AND STORAGE

- A. Store PVC material so that there is no exposure to sunlight.

2.00 PRODUCTS

2.01 MATERIALS

- A. Schedule 40 or 80 PVC Pipe: ASTM D1785, Type 1, Grade 1, rigid, unplasticized PVC, normal impact, bearing NSF seal. Fitting shall be in accordance with ASTM D2464, D 2465, or D 2467, or AWWA C110 or C153. Schedule 40 pipe shall not be threaded.
- B. C 900 Pipe: Pipe shall meet the requirements of AWWA C900 with outside diameter equivalent to cast iron pipe, in accordance with AWWA C900, Table 2. Fittings shall be in accordance with AWWA C110 or C153.
- C. SDR 26 Pipe: Pipe and fittings shall be in accordance with ASTM D2241.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install pipe, fittings, and specials to the lines and grades indicated. Install hangers, brackets, supports, etc., at spacings as recommended by pipe manufacturer. Flexible connections shall be required at locations where pipe passes through concrete walls. Begin installation at the main supply line valve and make connections where indicated.
- B. Excavate trenches where required to alignment and depth specified or as required for proper installation of pipe. Carefully lower pipe, fittings, and specials into the trench to avoid damage to the pipe and/or fittings. Take necessary precautions to protect pipe during backfilling operations. Replace any damaged pipe before it is buried. Keep the pipe clean during laying operations, and seal the pipe against the entrance of objects at the close of each operating day.
- C. Place thrust restraint fittings at bends, tees, crosses, valves, and plugs in the pipe line in accordance with approved Shop Drawing lay schedule.
- D. Buried ductile iron fittings shall be double wrapped in 8mm high density polyethylene encasement in accordance with AWWA C105, repair or replace encasements which have tears, rips or punctures in the polyethylene wrap.
- E. The minimum cover for 1- to 4-inch PVC piping shall be 36 inches. For 6-inch PVC piping and larger, the minimum cover shall be 48 inches.
- F. For threaded joints not more than three threads at each pipe connection shall remain exposed after installation. Ream ends of pipe after threading and before assembly, to remove burrs. Threaded joints shall be made up with a suitable joint compound. Apply joint compound to male threads only.
- G. Solvent weld joints shall be in accordance with ASTM D2855, and shall be made generally as follows: cut square and smooth the ends of the plastic pipe and wipe clean. Apply primer and solvent cement to the outside of the pipe and the inside of the fitting socket with a small brush. Immediately push the coated surfaces snugly together and rotate the pipe

approximately one-half turn to insure uniform distribution of the cement. Remove the excess cement by wiping. Cement shall be of type which welds plastic surfaces together. Cement shall be as recommended by the Pipe Manufacturer and shall be compatible with the chemical conveyed.

- H. Push-on joints shall be in accordance with the manufacturer's instructions.
- I. Use of deflected joints shall be at 75 percent of the manufacturer recommendation or longitudinal deflection shall be 133 percent of the manufacturer's minimum radius.
- J. Joint lubricant shall be as recommended by the pipe manufacturer.

3.02 FREEZE PROTECTION SYSTEM

- A. Heat tracing: Provide heat trace as directed on the Drawings and areas vulnerable to freezing. Heat trace shall be installed under the insulation.
- B. Heat tracing shall be automatic self-regulating, UL listed, with tinned copper braid, able to crossover itself without overheating, parallel circuit design, able to be cut to length at job site, flat and flexible for easy installation, corrosion and chemical resistant, complete with power connection kits, splice kits, end seal kits and necessary accessories for a complete operating installation 120 VAC, 60 HZ, 5W/ft.
- C. Cable shall be Raychem 5BTV1-CT or equal by Chromalox.
- D. Thermostat Control: NEMA 4X enclosure. UL listed ambient-sensors thermostat with adjustable set point. Acceptable manufacturers and models: Tyco Digrace AMC-1A-120V
- E. Contractor to provide necessary J-Boxes. J Boxes shall be Raychem JBM-100 for multiple connections and Raychem JBS-100 for single connection.
- F. Contractor to provide a minimum of end seal with LED per assembly, end seal shall be Raychem E100-L1A. LED shall be used to verify the system is on.
- G. All other end seal shall be Raychem E150.
- H. Tape shall be Raychem GT66.
- I. Pipe strap shall be Raychem PS-10.
- J. Labels shall be Raychem ETL.
- K. Insulation shall be a minimum of 1.5" thick mineral wool.
- L. Heat Trace to be installed by Raychem Trace Construction or manufacturer-approved installer.
- M. Contractor to provide and install necessary conduits and circuit per Division 26.

3.03 FIELD CONTROL HYDROSTATIC TESTING

- A. Test PVC pressure piping for leakage by a hydrostatic pressure test in accordance with Section 01 40 00 "Quality Management."

3.04 PURGING OF WATER LINES

- A. Purge, sterilize, and test the constructed water lines in accordance with Section 33 10 13 "Disinfecting of Water Utility Distribution."

1. During construction operations, maintain the installed surfaces of the system, which come in contact with the City's water supply, in a sanitary condition.
 2. Every effort must be made to keep the inside of the pipe, fittings, and valves free of loose foreign matter.
 3. Should the Contractor's carrier be required to transport potable water to the job site for main testing, sterilize tankage and piping, including pumps used to transport or transfer potable water into the main.
- B. When the entire pipeline or selected sections have been completed and are ready for use, disinfect the line or section according to the following procedures:
1. Flush piping sections.
 2. Flush back flow water from the system that has inadvertently entered the pipe.
 3. After purging and flushing, sterilize the system in accordance with procedures in Section 33 10 13 "Disinfecting of Water Utility Distribution."

3.05 SERVICE CONNECTIONS

- A. Make service connections in accordance with AWWA Manual M23 "PVC Pipe - Design and Installation" and the instructions from the Manufacturer. Use a service clamp or saddle to connect 2-inch and smaller services to PVC pipe sizes 4 to 12 inches. Use a ductile iron tapped tee to connect 3-inch service connections.

3.06 FIELD QUALITY CONTROL

- A. Do not enclose or cover any Work until inspected.

3.07 SCHEDULES

Service	Diameter (in.)	Type	Min. Design Pressure	Joint Type	
				Buried	Exposed
Water	0-2	Sched.80	300 psi	SW or THD	
	2-1/2, 3	Sched.80	300 psi	PO	SW or THD
	4-12	C900	150 psi	PO	N/A
Chemicals	0-6	Sched.80	250 psi	SW	SW
SW - Solvent Weld, THD – Threaded, PO - Push-On					

END OF SECTION

40 05 43 MISCELLANEOUS VALVES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install miscellaneous valves. Valves and accessories specified in this Section are to be installed only in the absence of product specifications in other Sections and must be approved by the Engineer. Review other Sections for specific requirements.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings.
 - 2. Operation and Maintenance Manuals.

1.03 GUARANTEE AND WARRANTY

- A. Manufacturer shall warrant the equipment and materials furnished under this Section against defects in materials and workmanship and operational failure for a period of 1 year from the date of Owner acceptance.
- B. In the event of failure of any part or parts of the equipment during the first year of service, provided that the equipment has been operated and maintained in accordance with good practice, the Manufacturer shall furnish and deliver a replacement for the defective part or parts at the Manufacturer's own expense. Manufacturer is also responsible for equipment freight.

2.00 PRODUCTS

2.01 BALL VALVES

- A. PVC Ball Valves
 - 1. PVC Ball Valves shall be furnished as indicated in the Contract Documents .
 - 2. Valves shall be true union, of Type 1 PVC, with PTFE seats, EPDM "O" rings and with socket end connections.
 - 3. Valves shall be:
 - a. Chemtrol TU Series Ball Valves, Schedule 80
- B. Stainless Steel Ball Valves
 - 1. Stainless Steel Ball Valves shall be furnished as indicated in the Contract Documents.
 - 2. Valves shall be full port, 316 stainless steel, with PTFE seats, and with flanged end connections. Valves shall be suitable for chemical service.
 - 3. Valves shall be:
 - a. Nibco

- b. Apollo
- c. Approved equal

3.00 EXECUTION

3.01 INSTALLATION

- A. Carefully handle and install valves in a manner that prevents damage to any part of the valves. Install valves in accordance with the Manufacturer's instructions.

END OF SECTION

40 05 53 IDENTIFICATION FOR PROCESS PIPING AND EQUIPMENT

1.00 GENERAL

1.01 WORK INCLUDED

A. Provide identifying devices for the following:

1. Piping.
2. Equipment.
3. Electrical Equipment.
4. Valves.
5. Control devices.

1.02 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:

1. Product data sheets for identifying devices.
2. A list of where devices are to be installed, and the data to be included on each identifying device.

1.03 STANDARDS

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. American National Standards Institute (ANSI) Standards:

ANSI A13.1	Pipe Marking Specifications
------------	-----------------------------

1.04 DELIVERY AND STORAGE

A. Store products inside storage sheds until installed.

1.05 GUARANTEES

A. Guarantee Identifying devices installed in wet locations or areas subject to moisture to be weather resistant for a period of 3 years after installation.

2.00 PRODUCTS

2.01 MATERIALS

A. Piping Identification: Pressure sensitive, adhesive-backed vinyl plastic label having the lettering indicated on background color as scheduled. Provide labels manufactured by the Seton Name Plate Corp. or Brady "Perma Code". Provide labels having an arrow to indicate the direction of flow. Provide 1-1/4-inch high letters.

- B. Outdoor Pipe Markers: Seton "Weather Code" Fade resistant, vinyl markers, 2-1/4 by 9 inches.
- C. Valve Identification: Provide Seton Style 250-BL Black Filled, 1-1/2-inch round, brass tag with proper identification stamped on tag. Tag shall have the proper prefix followed by a code number that is unique and identifies the valve from all others in the project. Provide hole in top of tag for mounting chain. Provide brass jack chain, copper metal meter seals, or brass "S" hooks as appropriate.
- D. Equipment Nameplate: Seton Style 2060 "Seton-ply" engraved plastic plaque, approximately 3/4 by 2-1/2 inches in size. Plaque shall be 1/16 inch thick having beveled edges and drilled with two mounting holes when attached by screws. Mounting screws shall be stainless steel. Lettering shall be approximately 3/16 inch high. Text to include equipment mark and equipment description (Example: EXHAUST FAN EF-5). Identification label on nameplate shall correspond to a typewritten legend included in the O & M Manual which includes the following:
 - 1. Equipment identifier.
 - 2. Location inside building (or on project site).
 - 3. Manufacturer's model number.
 - 4. Brief description of function.
 - 5. Reference to shop drawings, parts lists, or other data included in the O & M Manual.
- E. Fire Sprinkler System Signs: Signs for fire protection system shall conform to NFPA-13 and shall be equal to Seton Style SFB, furnished in porcelain with "white on red" color.

3.00 EXECUTION

3.01 PREPARATION

- A. Install piping complete with insulation and valves in place prior to installing identification devices. Mount electrical components, including electrical control devices. Piping shall be dry and free of oil, grease, or other contaminants. Insulation shall be completely dry.

3.02 INSTALLATION

- A. Install pipe labels on piping exposed to view, in any location inside buildings or structures, or in underground vaults, pump stations, basements, or other exposed locations.
- B. Install a minimum of one label in each area or room and additional labels at spacings not to exceed 5 feet. Position labels so that lettering is visible from the front of piping at floor level. Provide labels of a size that is legible from floor level. Install labels in rows with uniform spacings where several pipes run parallel to each other.
- C. Name the fluid flowing inside the pipe on color coded labels with text per the schedule below. Labels shall also include an arrow indicating the direction of flow.

3.03 VALVE IDENTIFICATION

- A. Install a valve tag on all valves. Attach the tag to hand wheel of valve stem so that it does not interfere with operation of valve tag brass link chains or copper meter seals furnished by the Tag Manufacturer.
- B. Number valves to correspond to a typewritten list included in the Operational and Maintenance Manual and include the following information:
 1. Valve Number.
 2. Description of piping fluid or purpose.
 3. Normal position of valve (Open or Closed).
 4. Manufacturer's catalog number.
 5. Brief description of valve specification.
 6. Brief description of valve's function in the system.
- C. Valve identification shall be based on the following example:

Valve Number	Function	Location	Normal Position	Mfg's Cat No.	Valve Type	Description
P-1	Domestic Water	Rm. 103	Open	Crane Fig. 315C	Gate rising stem	Shut off to heater

3.04 EQUIPMENT IDENTIFICATION

- A. Provide an equipment identifier on each separate piece of equipment, including process equipment, HVAC equipment, plumbing equipment (other than plumbing fixtures), and electrical equipment. Provide a nameplate for each separate piece of electrical equipment, including but not limited to panelboards, switchgear, starters, disconnects, control devices and control panels. Provide name tags for each separate switch, starter, contactor, or other compartment on electrical switchgear.
- B. Engrave lettering on nameplates corresponding to the identification marks. Install nameplates prominently on equipment not occurring in occupied spaces. Install nameplates on the inside covers of lighting panelboards. Install nameplates on all other equipment centered and at top of equipment. Nameplates shall not be installed in a location that interferes with the equipment's ability to operate.
- C. Attach nameplates to exterior equipment with two 3/8-inch stainless steel screws. Interior plaque may be attached by screws, or by the adhesion method when approved by the Engineer.

3.05 ELECTRICAL OUTLET

- A. Provide a nameplate for electrical outlet listed below. The nameplate shall be white letters on red background, and shall specify the outlet's voltage and ampere rating. The nameplate on special outlets shall have an appropriate warning. Lettering shall be 1/8 inch high. Overall plate size shall be approximately 3/4 by 2-1/2 inches.
- B. Provide nameplates on the following:
 1. 208/240 outlet: voltage and ampere rating.

2. Special outlet: voltage, ampere rating and intended function (Example: Welder Outlet 240 V – 40 A).

3.06 POTABLE AND NON-POTABLE WATER

- A. Provide name tags at every water hydrant or outlet. Fabricate name tags of 3/4-by-1-1/2-by-1/8-inch aluminum with a medium, duranodic finish and plexiglas face panel. The face panel shall have 1-inch high, white, helvetica medium lettering on blue background stating “Potable Water”, or white lettering on green background stating “Non-Potable Water”. Place signs on walls above the hydrant locations and attach to backplates. Yard hydrants shall have concrete piers which are 6 inches in diameter by 36 inches with signs attached to the face of the concrete directly in front of the hydrants. Extend the piers 4 inches minimum above finish grade. Signs shall be manufactured by Vomer Products, Inc., equal to Vocator Exterior sign series E9/12.

3.07 SCHEDULES

- A. Prepare a typed schedule showing piping label requirements, valve tag identification, and equipment tags. Include each valve or piping type and the appropriate identification on the schedule. Submit the schedule to the Engineer for approval.
- B. Mark valve tags and pipe labels to conform with the following legend, or with requirements of standards noted. Include the full name, as appearing under the column heading “Description”, and the abbreviation under the column heading “Abbrev. Legend.”

Description	Valve Prefix	Abbrev. Legend	Label Color (Letter on Background)
Plumbing			
Sewer, Sanitary	W	SW	Black on Green
Sewer, Storm	SS	SS	Black on Green
Waste, Drain	W	DP	Black on Green
Waste, Acid	W	AW	Black on Yellow
Water, Domestic, Cold	P	CW	Black on Green
Water, Domestic, Hot	P	HW	Black on Yellow
Water, Domestic, Ret.	P	HWR	Black on Yellow
Water, Distilled	P	DW	Black on Green
Water, Non-potable	N	NPW	Black on Green
Fire Protection			
Fire Protection, Mains	F	FM	White on Red
Fire Protection, Sprinkler	F	FS	White on Red
Gas Piping			
Natural Gas	G	NG	Black on Yellow
Fuel Gas	G	NG	Black on Yellow

Description	Valve Prefix	Abbrev. Legend	Label Color (Letter on Background)
Acetylene	G	AC	Black on Yellow
Argon	G	AG	White on Blue
Hydrogen	G	HG	Black on Yellow
Nitrogen	G	NI	Black on Green
Nitrous Oxide	G	NO	White on Blue
Methane	G	MT	Black on Yellow
Oxygen	G	OX	Black on Yellow
Compressed Air	G	CA	White on Blue
Instrument Air	G	IA	White on Blue
Vapor	G	VG	Black on Yellow
Vacuum	G	VP	White on Blue
HVAC			
Refrigerant, Suction	H	RS	Black on Green
Refrigerant, Liquid	H	RL	Black on Green
Chilled Water	H	CW	Black on Green
Chilled Water Ret.	H	CWR	Black on Green
Hot Water	H	HW	Black on Yellow
Hot Water, Ret.	H	HWR	Black on Yellow
Condensate	H	CD	Black on Green
Process Piping			
Lime	PP	LI	White on Green
Chlorine	PP	CH	Black on Yellow
Ammonia	PP	AM	Black on Yellow
Primary Effluent	PP	PE	White on Green
Primary Sludge	PP	PS	White on Green
Raw Sewage	PP	SR	White on Green
Recir. Sewage	PP	RS	White on Green
Recir. Sludge	PP	RR	White on Green
Thickened Sludge	PP	TS	White on Green
Activated Sludge	PP	AS	White on Green
Electrical			
Panelboards	LP-1		White on Black
Starters for Exhaust Fan	S/EF-1		White on Black

Description	Valve Prefix	Abbrev. Legend	Label Color (Letter on Background)
Control Panels for Exhaust Fan	CP/EF-1		White on Black
Disconnects for Exhaust Fan	DS/EF-1		White on Black
Junction Boxes	JB/101		White on Black
Controllers for Exhaust Fan	CI/EF-1		White on Black

C. Piping Color Schedule:

Description	Pipe Color
Potable Water	Light Blue
Compressed Air	Light Green
Instrument Air	Light Green with Dark Green Bands
Chlorine (gas, liquid, or vent)	Yellow
Chlorine (solution)	Yellow with Red Bands
Liquid Alum	Yellow with Orange Bands
Alum (solution)	Yellow with Green Bands
Ammonia	Yellow with Brown Bands
Chlorine Dioxide (solution)	Yellow with Blue Bands
Ferric Chloride	Brown with Red Bands
Ferric Sulfate	Brown with Yellow Bands
Polymers	White with Green Bands
Liquid Caustic	White with Red Bands
Caustic (solution)	White with Orange Bands
Fluoride	White with Yellow Bands
Ozone	Stainless Steel with White Bands
Settled Water	Green
Filter Effluent	Light Blue
Backwash Supply	Light Blue
Drain	Dark Grey
Raw Water	Tan

END OF SECTION

40 90 01 INSTRUMENTATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install all equipment for complete instrumentation and controls. Contractor's work shall include but not be limited to the following:
 - 1. Installation of equipment furnished under this contract.
 - 2. Interconnections between equipment furnished under this contract.
- B. The Contractor's attention is directed to the fact that instrumentation is an integrated system and as such shall be furnished by one vendor or system integrator who shall provide all the equipment and appurtenances, regardless of manufacture, and be responsible to the Contractor for satisfactory operation of the entire system.
- C. Supervision, labor, tools, and materials necessary for installation of the instrumentation equipment and material furnished herein and their interconnection shall be provided by the Contractor. Installation work shall conform to applicable city, state, and national building and electrical codes.
- D. Coordinate the work of the system manufacturer's service personnel during construction, testing, calibration and acceptance of the instruments.

1.02 QUALITY ASSURANCE

- A. GENERAL: Equipment shall be the Manufacturer's latest and proven design. Specifications and drawings call attention to certain features, but do not purport to cover all details entering into the design of the instrumentation system. The completed system shall be compatible with the functions required and the equipment furnished by the Contractor.
- B. OPERATING VOLTAGE: Electrical components of the system shall operate on 120 volt, single-phase, 60 Hertz, except as otherwise noted in the specifications.
- C. POWER SUPPLIES: The drawings and specifications indicate the energy sources that will be provided. Any other devices or power supplies necessary to obtain proper operation of the instrument system from these energy sources shall be furnished with the instrumentation.
- D. PROTECTION
 - 1. The instrumentation system supplier shall be responsible for input-output isolation of all incoming and outgoing signals.
 - 2. Each 4-20 mA DC process measurement current loop installed on this contract which extends outside the PLC enclosure shall be protected by insertion of a 1/16 amp fuse, Buss Type MKB. Fuses shall be installed in standard fuse blocks behind the PLC enclosure door.
 - 3. The necessary fuses or switches required by the Instrumentation Manufacturer shall be provided with the equipment. The instruments requiring an internal power supply shall have an internal ON-OFF switch.

E. INPUT/OUTPUT

1. In general and unless specifically stated otherwise, inputs and outputs involving instrumentation systems shown shall be 4-20 mA DC process measurement signals. Current loop isolators, current repeaters, or other signal isolators shall be furnished and installed as required to meet instrument specifications and to make instrumentation system fully operational.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Document Management" and shall include:

1. Shop Drawings

- a. Shop drawings shall be submitted to the Engineer for approval before fabrication or shipment to the job. Equipment shall not be fabricated or shipped to the job before receipt of approved shop drawings from the Engineer. Submittals for approval shall include component manufacturing data sheet indicating pertinent data and identifying each component by item number and nomenclature:
- b. The submittal shall be organized with a cover sheet listing each instrument being provided. Each instrument shall be listed with the associated tag name, model number, and specified options.
- c. Separated by tabbed sections, each section shall include the product cut sheets from the manufacturer.
- d. The manufacturer shall be responsible for preparation of the required sets of these drawings for distribution as indicated in Division 0 and Division 1 specifications.
- e. Shop drawings submitted for all equipment furnished under this section of the specifications, shall be submitted at the same time in the same package. Partial submittals will not be reviewed. Sales bulletins and other general publications are not acceptable as submittals for approval.

2. Equipment installation Report.

- a. Contractor shall provide an Equipment Installation Report for each instrument (flow meter, level transmitter, etc.) to the Engineer for approval. The equipment installation report shall include documentation stating that the instrument was installed and properly calibrated per the manufacturer's recommendations by an Authorized representative of the instrument manufacturer. All parameters required for programming of the instrument shall be provided in a hard copy format as part of the equipment installation report. Documentation stating that the person performing the calibration and start-up is an authorized representative shall be provided as well.

3. Operation and Maintenance Manuals

- a. Operating instructions shall incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications.
- b. Wiring diagrams shall clearly show terminal numbers and wire numbers as they actually are in the instrumentation system.

- c. Instrument panel wiring shall be such that each wire installed has its own number designation at each end and such that no number is repeated.
- d. Setup parameters: O&M shall include an ISA datasheet with each instrument. The ISA form shall be filled out with ordering information, setup parameters, ranges, and approximate location.
- e. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. ASTM A-126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
 - 2. ASTM B-61 Specification for Steam and Valve Bronze Castings

1.05 JOB CONDITIONS

- A. SPARE PARTS
 - 1. Furnish all standard recommended spare parts as indicated in the Manufacturer's instruction manuals, for each component in the system.
 - 2. Furnish the following non-standard spare parts:
 - a. One (1) box of each different type and size of fuses.
- B. SPECIAL TOOLS: Furnish a kit which contains special size wrenches and other types of tools, not normally available, which are necessary for assembling, disassembling, aligning, and calibrating each piece of equipment. In addition, any piece of equipment (meter, test set, etc.) required by the Manufacturer to align, adjust, or otherwise calibrate any item under this section of the specification shall be furnished.

2.00 PRODUCTS

2.01 REMOTE EQUIPMENT

- A. Controls for remote electrically operated or motor driven equipment shall be complete, including the necessary auxiliary relays so as to require only wiring and connections to the equipment control circuit. Contacts for control of remote motor operated or electrically operated equipment shall be rated not less than 10 amperes at 120 volts unless otherwise specified herein.
- B. Remote motor operated or electrically operated equipment shall have a separate 120 volt control circuit which operates through the dry contacts provided by the instrumentation system.

2.02 ENCLOSURES/PANELS

- A. Enclosures and panels as indicated on the plans and in this specification shall be furnished, installed, and wired. Enclosures shall be NEMA 4X stainless steel for outdoor environments and NEMA 1 enclosures for indoor environments, unless specifically stated otherwise.

2.03 PRESSURE TRANSMITTER

- A. Gauge Pressure transmitter shall be of the capacitance type with a process isolated diaphragm with silicone oil fill, microprocessor based "smart" electronics, and a field adjustable rangeability of 20:1 input range. Span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally. Transmitters shall be NEMA 4X weatherproof and corrosion resistant construction with low copper aluminum body and 316 stainless steel process wetted parts. Accuracy, including nonlinearity, hysteresis and repeatability errors shall be plus or minus 0.100 percent of calibrated span, zero based. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits. Output shall be linear isolated 4-20 mA, 24 VDC. Power supply shall be 24 VDC, two-wire design. Each transmitter shall be furnished with a 4 digit LCD indicator capable of displaying engineering units and/or milliamps and mounting hardware as required.
- B. Transmitter shall be a Endress + Hauser Cerabar PMP71B, or pre-approved equal by addendum. Transmitter shall be supplied with a 316 Stainless Steel Block and Bleed Valve, Endress + Hauser, or pre-approved equal by addendum.

Tag	Service	Range
PE/LIT-701-01	EXISTING CS-T1 ALUM TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-02	EXISTING CS-T2 ALUM TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-03	EXISTING CS-T3 ALUM TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-04	EXISTING CS-T4 ALUM TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-05	CS-T5 ALUM TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-06	EXISTING CS-T6 FLUORIDE TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-07	EXISTING CS-T7 AMMONIA TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-08	CS-T8 CAUSTIC TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-09	CS-T9 CAUSTIC TANK LINE PRESSURE	0-16.5 FT
PE/LIT-701-11	CS-T11 CAUSTIC TANK LINE PRESSURE	0-16.5 FT
PE/LIT-702-01	POLYMER STORAGE TANK	0-3.5 FT

2.04 FLOATS

- A. Containment Area Floats

1. Float shall contain mechanical switch with Form C contact. Switch shall be SPDT, Rated 1A max, 120VAC, 25Watts Maximum Non-Inductive at a mechanical life of 10 million operations
2. Float diameter 5-1/2" diameter housing made of 316 stainless steel
3. Manufactured by Contegra Model FS 90.
4. Provide stainless steel mounting clip for cable mount.
5. Manufacturer supplied cable shall be sufficient length to reach termination cabinet without splicing.
6. Floats shall be rated to be used with alum and caustic material.

Tag	Location	Service
LSH-701-10	CHEMICAL STORAGE FACILITY CONTAINMENT AREA	CHEMICAL
LSH-701-11	CHEMICAL STORAGE FACILITY CONTAINMENT AREA	CHEMICAL

2.05 MAGNETIC FLOW METERS

- A. Magnetic Flowmeter meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube. Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction, and shall produce DC signals directly proportional to the liquid flow rate. Meters shall be capable of bidirectional flow and totalize for forward, reverse and net totals.
- B. Each meter shall be furnished with a stainless steel metering tube and carbon steel flanges with a neoprene, NBR or hard rubber liner and 316 SS or Nickel Alloy 276 electrodes. Linerless designs are unacceptable. Line protectors shall be provided on all flow tubes. Grounding rings shall be 316 SS and shall be supplied with the meter (grounding electrodes are not acceptable).
- C. The flow element shall be NEMA 4 water tight construction unless supplied in a meter vault/below ground installations in which they shall be of IP 68 construction (factory installed). Flow elements located within vaults must be classified for use in Class I, Division II for non-flammable fluids in hazardous areas. CSA classifications will not be permitted.
 1. Remote mounted heads with junction boxes shall be submersible IP-68 rated, factory installed.
- D. Accuracy shall be 0.4% of rates over a velocity range of 1 to 30 ft/sec. Repeatability shall be 0.1% of rate. Minimum turndown shall be 100:1.
- E. The transmitter shall provide a pulsed DC coil drive current to the flow tube and shall convert the returning signal to a linear, isolated 4-20 mA DC signal. The transmitter shall utilize "smart" electronics and shall contain automatic, continuous zero correction, signal processing routines for noise rejection. The transmitter shall have low flow cut-off that is user configurable. The transmitter shall be either remote mounted and have a polyurethane painted dual compartment aluminum, NEMA 4X housing, or close coupled to the unit with a NEMA 4X housing. Plastic housings are not acceptable. The transmitter shall utilize a 90-220

- VAC power supply and have outputs including 4-20 mA (Hart), scalable frequency (0-10,000 Hz), pulse output, and two (2) discrete outputs (to 30 VDC).
- F. The Magmeter shall have built-in self-diagnostics with troubleshooting codes and meter verification capability to include:
 - 1. Coil resistance.
 - 2. Coil signature value.
 - 3. Electrode resistance
 - 4. High process noise detection
 - 5. Electronics temperature monitoring
 - 6. Wiring and grounding verification
 - 7. Coil fault detection
 - 8. Empty pipe detection
 - G. Sufficient manufacturer furnished and installed sensor cable shall be provided for interconnection between the flow element and the transmitter. Cable(s) shall facilitate both signal and power for the flow element. Length of cable shall be coordinated with the contractor.
 - H. Electromagnetic flowmeters shall be Siemens SITRANS F M MAG 5100 W with MAG 6000 transmitter, Endress and Hauser Promag W 400, Rosemount 8750W or pre-approved equal by addendum.
 - I. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Endress + Hauser, Promag W 400
 - b. ABB Instrumentation
 - c. Rosemount
 - d. Siemens
 - e. Or approved equal.
 - J. Description: Low-frequency, electromagnetic induction-type flow meter, producing a linear signal directly proportional to flow rate, consisting of flow tube, signal cable, and transmitter.
 - K. Performance and Design Criteria:
 - 1. Design: According to AWWA M33
 - L. Flow Rate Range: As indicated on drawings and on the instrument schedule.
 - M. Size: As indicated on drawing and on the instrument list schedule.
 - N. Flow Tubes:

1. Body Material: Type 304 stainless steel
 2. Liner: Provide a liner that is compatible to the process flow that is being measured. Unless otherwise specified in the instrument schedule, provide the following based on the process flow conditions:
 - a. For standard process flows, provide polyurethane or composite elastomer unless otherwise specified in the instrument schedule.
 - b. For sludge applications, provide neoprene unless otherwise specified in the instrument schedule.
 - c. For chemical service, consult with manufacturer and provide compatible liner.
 3. Length: As indicated on Drawings.
 4. End Connections: Flanged, ANSI 150lb or DIN PN 16 carbon steel as required by the piping system, unless otherwise indicated, for 2" flow tubes and larger. Mechanical-type couplings, for flow tubes smaller than 2" for chemical metering. ANSI 150 lb. or DIN PN 16 stainless steel flanges shall be used on all SS process pipes.
 5. Environment: For meters with remote mounted transmitters, meters below grade shall be suitable for submergence for up to 48 hours to a depth of 30 ft (9m). Meters above grade shall be NEMA 4X (IP65).
- O. Electrodes:
1. Provide electrodes that are compatible with the process flow that is being measured. Unless otherwise specified in the instrument schedule, provide the following based on the process flow conditions:
 - a. For standard service, provide 316L stainless steel at minimum.
 - b. For sludge service, provide 316L stainless steel at minimum.
 - c. For chemical service, consult with manufacturer and provide compatible electrode.
 2. Self-cleaning.
- P. Accuracy: Plus or minus 0.5 percent of actual flow rate over a 30:1 range, within velocity limits of 0.1-10.0 ft/sec.
- Q. Provide adjustment for zero and span.
- R. Accessories:
1. Option: Integral level compensation to allow accurate measurement of flow in pipes between 10% to 100% fill level.
 2. Option: Rated for hazardous area in accordance with the area classification and the drawings.
 3. Provide automatic, nonmechanical electrode cleaning system without taking meter out of service.
 4. Furnish cable between transmitter and receiver.
 5. Furnish grounding rings, wires, and gaskets as recommended by the manufacturer. All materials must be suitable for the process and surrounding pipe.

Tag	Description	Flow Range	Line Size	Pipe Type	Stream Description	Transmitter Location
FE/FIT-706-01, 02	POLYMER SYSTEM	0.0-0.64 GPH	1"	PVC TUBING	POLYMER	REMOTE MOUNT

2.06 FLOW TRANSMITTERS

- A. Manufacturer: Same manufacturer as meter.
- B. Transmitter Output:
 - 1. 4- to 20-mA analog signal.
- C. Housing: NEMA 4X (IP65), suitable for surface or pipe stand mounting.
- D. Control Power:
 - 1. Wiring: As specified in Division 40.
 - 2. 120-Vac, single phase, 60 Hz.
 - 3. Furnish local transformers as required.
- E. HMI:
 - 1. Touch-screen programming, functioning through enclosure window without opening enclosure.
 - 2. Display:
 - a. Size: four lines by 16 characters
 - b. Type: Backlit digital display
 - c. User-selectable engineering units.
 - d. Readout of diagnostic error messages.
- F. Mounting:
 - 1. Mounting: Remote, up to 100 feet (30.48 m) from flow meter.
 - 2. Remote Mounting Locations less than 4 feet (1.2 m) above grade: Provide stainless-steel mounting posts.
- G. Transmitter Communication Interface: HART
- H. Accessories:
 - 1. Optional: If required, provide bi-directional flow indication, and transmission by means of a relay output or a second analog output.
 - 2. Optional: A fully configurable totalizer integral to the transmitter. Totalized flow shall be locally viewable.
 - 3. Current signal output simulation.

4. Empty pipe detection.
5. Self-diagnostics.
6. Optional: Field validation package that compares current operational status to a factory baseline to verify meter performance. Furnish field verification hardware and software tools as required, and compatible transmitters.
7. Automatic zero adjustment.
8. For outdoor installations, provide a sunshield of sturdy, corrosion- and UV-resistant material.
9. Signal Cable: Provided by flow meter manufacturer. Length as required for remote mounting of the transmitter.

3.00 EXECUTION

3.01 INSTALLATION

- A. Wire each device requiring power so that when wires are removed from any one device, power is not be disrupted to any other device. Ground the case of each device either by mounting directly on a steel frame or by a third wire.

3.02 FIELD QUALITY CONTROL

- A. The supervisory service of a factory-trained service engineer who is specifically trained on the type of equipment herein specified shall be provided during construction to assist the Contractor in the location of sleeves; methods of installing conduit and special cable; mounting, piping, and wiring one of each type of device, and the methods of protecting all of the equipment prior to placing it into service. Upon completion of the installation, the services of the above service engineer shall be provided for calibration and start up of the equipment and for instructing the operating personnel. The Manufacturer shall provide sufficient service to place the system in satisfactory operation.
- B. Upon completion of installation of sample pumps, an acceptance test to verify the satisfactory operation of each unit shall be conducted. The test shall be conducted in a manner approved by and in the presence of the Engineer. The unit shall be checked for excessive noise, vibration, alignment, general operation, etc. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.
- C. Check out and calibrate the system upon completion of the installation.
- D. Prior to the Owner turning on any form of energy to the system, the Contractor shall provide the Engineer with a certified statement of approval of the installation including his supplier's authorization for turning on energy to the system.

3.03 STARTUP SERVICE

- A. The flow tube for the flow meter shall be factory calibrated and the calibration data included in the O&M Manual.

3.04 DEMONSTRATION

- A. While starting up the instruments, the manufacturer shall provide training to the Owner's instrumentation technicians. The training shall be in how to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.

END OF SECTION

44 42 73 CHEMICAL STORAGE TANKS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install liquid chemical storage tanks as specified herein.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Tank shall meet the following design criteria, following the 2015 International Building Code:
 - 1. Wind load limit when anchored: 120 mph with 3 second gust design and an ultimate windspeed of 140 mph.
- B. Performance Requirements:
 - 1. Polyethylene Tanks:
 - a. Density: ASTM D1505.
 - b. ESCR Thickness: ASTM D1693.
 - c. Tensile Strength: ASTM D638.
 - d. Elongation at Break: ASTM D638.
 - e. Brittleness Temperature: ASTM D746.
 - f. Flexural Modulus: ASTM D790.
 - g. Impact: ASTM D746.
 - h. Degree of Crosslinking: ASTM D2765.
- C. Manufacturer's Representative for Startup and Testing: The services of the Manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's operating personnel, troubleshooting and other services as required in Section 01 75 00 "Starting and Adjusting."

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop drawings:
 - a. Shop drawing information shall include critical dimensions, fitting locations, construction materials, approved chemical storage and details of inlet and outlet fittings, manways, flexible connections, vents, ladders, restraints, and supports.
 - b. The Manufacturer's literature shall include a description of construction of tank walls, fittings, and quality control procedures for in plant inspection of the tank during construction. Chemical resistance charts shall be by the Tank Manufacturer

and based upon the Tank Manufacturer's data. Resin manufacturer data sheet shall be provided.

- c. Include electrical heat tracing and foam insulation data sheets.
 - d. Calculations for the tank restraint system showing wind criteria per IBC 2015, ASCE 7-10 Ch. 15 shall be stamped and signed by a registered engineer.
 - e. Tank Manufacturer shall submit assurance that field repair service can be offered and that the Tank Manufacturer has a representative that works in the project area.
 - f. Submittal data shall be in such form and so presented that the Engineer may readily review the data.
 - g. The Manufacturer shall submit a list of 10 similar installations which have been in satisfactory operation for at least 3 years.
2. Operation and Maintenance Manuals for chemical storage tanks.
 3. Certified Test Reports:
 - a. Wall thickness verification
 - b. Impact test
 - c. Gel test
 - d. Hydrostatic test

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety. Chemical storage tanks shall be in full compliance with the applicable standards and specifications.

1. American Society for Testing and Materials (ASTM) Standards

ASTM D1998	Standard Specification for Polyethylene Upright Storage Tanks
------------	---

1.05 DELIVERY AND STORAGE

- A. Closely check the tanks upon delivery for damage. If damaged, do not accept the tanks. Handle the tanks with care to prevent inadvertent damage during installation.

1.06 GUARANTEES

- A. All tanks and associated equipment and appurtenances shall be guaranteed against defects in material and workmanship for a period of 2 years from the date of substantial completion of the project.

2.00 PRODUCTS

2.01 POLYETHYLENE TANKS

- A. Approved Manufacturers:
 1. Poly Processing

2. Snyder Industries

- B. The tank shall be a one-piece rotationally molded tank made from high density cross-linked polyethylene. The plastic shall not contain any fillers and shall contain a minimum of 0.25 percent and a maximum of 0.50 percent ultraviolet stabilizer. The tank shall be flat bottom with a minimum knuckle radius at the wall of 1-1/2 inches. Tolerance on the outside diameter including out of roundness shall be plus or minus 3 percent. The finished surface shall be free from visual defects, such as foreign inclusions, air bubbles, pin holes and craters. A minimum wall thickness shall be supplied to provide a hoop stress of 650 psi at the point of highest stress.

1. Flanged Nozzles:

- a. Outlets shall be SUMO as manufactured by Snyder, or IMFO as manufactured by Poly Processing.
- b. Fittings and piping shall be PVC "Two Flange Fittings."
- c. Flanged diameter and drilling shall be 150 pound ANSI B.16.5.
- d. Gaskets shall be EPDM.
- e. Bolts shall be 316 stainless steel. All stainless steel bolts must have anti-sieze compound applied.

2. Vent shall be 6-inch "U" Vent for bulk tanks and 4-inch "U" Vent for day tanks.

3. Manway shall be 24-inch top flanged for bulk tanks and 10-inch top flanged for day tanks.

4. Tie-down lugs and tank lifting lugs shall be provided in accordance with the Manufacturer's installation instructions.

5. Level Indication:

- a. Provide clear Lexan sight tube with isolation valve on each end to allow removal of tube for maintenance or replacement. Major gradation marks every 100 gallons, minor marks at 50-gallon intervals. Provide sight tube suitable for operation in the intended chemicals.
- b. Provide ultrasonic level and pressure indicators in accordance with Section 40 90 01 "Instrumentation."

6. Pipe support brackets for riser pipes shall be rigidly connected to the tank with a gasketed stud bolt.

7. The ladder shall be aluminum or fiberglass and shall be designed so that it is supported from the concrete pad with non-penetrating connections to the tank wall. Ladder rungs shall extend from the ground to the top of the tank. If required by safety regulations, provide handrails around the top of the tanks that meet the regulations.

2.02 DAY TANKS

- A. Furnish and install one (1), 295-gallon day tank with cover lids for the ammonia system. Day tank shall be constructed of Polyethylene. Day tanks shall have clear graduations at 5-gallon increments and shall have fittings for pipe connections at the bottom of the tank wall. Day tank shall be supplied with a clear Lexan sight tube with isolation valve on each end to allow

removal of tube for maintenance or replacement. Major gradation marks every 100 gallons, minor marks at 50-gallon intervals. Provide sight tube suitable for operation in the intended chemicals

2.03 INSULATION AND HEAT TRACING

- A. Polyethylene Tanks: The caustic bulk storage tanks shall be insulated with a 2- to 3-lb/ft³ two-part polyurethane foam material with an “R” value of 8.33/in. The foam shall have a minimum uniform thickness of 2 inches and a maximum thickness of 3 inches. The tank shall have two full coverage coats of latex mastic coating shall be applied to the surface of the insulation in such manner as to seal the insulation from the outside environment.
- B. The caustic tank shall have a factory installed limiting electrical heat tracing system to maintain tank contents of 60 F when ambient temperatures are 5 F.
- C. Manufacturer shall provide a 120-volt tank heater on the caustic tank. The heater shall not draw more than 24 amps. Contractor shall be responsible for replacing conductors, circuit breaker, conduit and any up-stream electrical supply should the heater use more power.

3.00

3.00 EXECUTION

3.01 INSTALLATION

- A. Install the tanks in accordance with the Manufacturer’s instructions as approved by the Engineer.
- B. The tank foundation must provide smooth continuous full bottom support (maximum deviation 1/8 inch per 10 feet in any direction). Tanks must not be grouted.
- C. Provide tanks with a minimum of two NFPA hazard labels. Install vinyl labels with permanent adhesive, four-color background and 4-inch numbers.
- D. The chemical’s name shall be affixed to the tank using an adhesive backed vinyl label. The chemical name shall be 8-inch tall lettering for bulk tanks and 4-inch tall lettering for day tanks.
- E. Certification Label Stating:
 - 1. Tank material, including applicable liners, resins, or reinforcement.
 - 2. Chemical to be stored including:
 - a. Concentration.
 - b. Specific gravity.
 - c. Maximum temperature.
 - 3. Tank capacity.
 - 4. Date of manufacture.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of tank installation and before connections are made and equipment attached, a hydrostatic test to verify the satisfactory operation of the unit shall be

conducted. Block outlets and fill tank with clear water for a period of at least 24 hours. Any leaks which are detected shall be repaired and be retested until all leaks have been detected and repaired to the satisfaction of the Engineer. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.

3.03 CLEAN AND ADJUST

- A. After installation is complete and piping connections are made, clean the tank and nozzles with a mild soap solution and rinse with 180 F water.

3.04 SCHEDULES

A. Bulk Tanks:

Tank Contents	Alum	Caustic	Polymer
Tank Tag No.	CS-T5	CS-T8 to CS-T11	P-T1
Specific Gravity	1.31	1.54	1.032 – 1.044
Material	HDXLPE	HDXLPE	HDXLPE
Number of Tanks	1	3	1
Minimum capacity to top of straight shell (gallons)	14,950	13,650	250
Approximate outside diameter	13'-9"	13'-9"	3'-0"
Approximate straight shell height	14'-9"	12'-8"	4'-6"
Approximate total height	16'-8"	14'-7"	5'-6"

B. Day Tank:

Tank Contents	Ammonia
Tank Tag No.	AM-T1
Specific Gravity	1.0
Material	HDXLPE
Number of Tanks	1
Minimum capacity to top of straight shell (gallons)	295
Approximate outside diameter	4'
Approximate straight shell height	3'-7"
Approximate total height	4'-8"

C. Fittings:

Tank Tag No.	Manway	Fill	Outlet	Vent	Ladder (Y/N)	Restraint (Y/N)
CS-T5	24"	3"	2"	4"	Y	Y
CS-T8 to CS-T11	24"	3"	2"	4"	Y	Y
AM-T1	10"	2"	2"	2"	N	N
P-T1	10"	2"	2"	2"	N	N

END OF SECTION

46 33 41 CHEMICAL FEED PUMPS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to install chemical feed pumps as specified herein. The chemical feed pumps shall be peristaltic pumps, as specified herein and identified in the Schedule at this end of this Section, capable of dosing chemicals from the storage tanks to the points of application.

1.02 QUALITY ASSURANCE

- A. Acceptable Metering Pump Manufacturers
 - 1. Peristaltic – Pumphead Style
 - a. Watson Marlow, Inc. Qdos Universal+ Series Pumps.
 - 2. Peristaltic – Tubing Style:
 - a. Watson-Marlow Series 500, 600, and 700.
 - b. Blue-White Industries, Ltd. ProSeries-M Flex-Pro Models M-3 and M-4.
 - c. Verder Vederflex Vantage 5000 SCADA HV Model.
- B. Source Limitations: Equipment units of each type specified in this Section shall be supplied by a single manufacturer.
- C. Manufacturer: All equipment shall be the product of a manufacturer having at least fifteen (15) U.S. installations of the type being proposed, each with a minimum of five (5) years of satisfactory service.
- D. The Contractor shall assume the full responsibility for the satisfactory operation of the entire pumping systems including peristaltic pumps , motors, valves, and controls as specified.
- E. All components and materials of each chemical feed assembly and the individual components and piping shall be compatible for the intended chemical service.
- F. Manufacturer’s Representative for Startup and Testing: The services of the manufacturer’s technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner’s operating personnel, troubleshooting and other services as required in accordance with Section 01 75 00 “Starting and Adjusting.” A minimum of 8 hours not including travel time and a minimum of two trips shall be provided.
- G. Design Criteria: All pumps, whether named as an acceptable supplier or submitted as an equal must, at a minimum, meet the following critical design requirements:
 - 1. Pump shall be 24 hr continuous duty rated and have a three-year manufacturer's warranty from date of shipment.
 - 2. For quality assurance, pumps must be supplied and labeled by the original manufacturer. Relabeled products, even under license by manufacturer, shall not be acceptable.

3. Manufacturer must have a minimum twenty (20) years of experience manufacturing peristaltic pumps, must have a direct business presence in the United States for minimum of twenty (20) years, and must employ a minimum of fifty (50) employees in the United States. Manufacturers without a direct American presence who distribute through a third party distributor are not acceptable.
 4. Pumps must be manufactured in compliance with ISO 9001-2008 standards.
 5. Pumps shall be meet CE, NSF 61, and applicable electrical standards.
 6. To ensure proper function and quality, pumphead, tubing, and drive must be manufactured by the same company. Tubing purchased by the pump manufacturer from a third party is not acceptable.
- H. Deliver, Storage, and Handling
1. Shipping
 - a. Ship the pumps completely assembled and ready for installation. Ship tubing separately for field installation and process line connection by contractor.
 - b. Pack all additional spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 - c. Deliver spare parts at the same time as pertaining equipment. Deliver to Owner after completion of work.
 2. Receiving
 - a. Contractor to inspect and inventory items upon delivery to site.
 - b. Contractor to store and safeguard equipment, material, instructions, and spare parts in accordance with manufacturer's written instructions.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
1. Product Data: For each type of product indicated, include construction details, material descriptions, and dimensions of individual components including rated capacities, operating characteristics, instrumentation and electrical characteristics, and furnished specialties and accessories.
 2. Shop Drawings:
 - a. Manufacturer and model number of all equipment within this specification, and an itemized list of components being furnished.
 - b. Layout drawings including all proposed system components, dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Design performance characteristics, including, sizes, capacities, head, viscosity, and NPSH requirements over the operating ranges, and other appropriate information.
 - d. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on shop tests of similar units, that appear on

data sheets, which show that they meet the specified requirements of head, capacity, and horsepower. Provide characteristic performance curve showing flow rate as a function of RPM and pressure.

- e. Listing of materials of construction, coatings, and chemical compatibility.
 - f. Wiring Diagrams: Project specific power, signal, and control wiring, including information on controls and monitoring devices furnished. Complete point to point wiring diagrams shall be provided. Diagrams shall be updated at the end of the Project based on changes made in the field during start-up and commissioning and be provided to the Owner in the final O&M manuals.
 - g. Elevation of all wiring junction boxes.
 - h. Setpoints for all controls and instrumentation.
 - i. Complete information on all electric and instrumentation equipment and electric power requirements.
3. Information Submittals:
- a. Manufacturer's Certification of Compliance.
 - b. Special shipping, storage and protection, and handling instructions.
 - c. Manufacturer's instructions for installation.
 - d. Manufacturer's Certificate of Proper Installation.
 - e. Location of nearest stocking distribution of spare parts.
 - f. Suggested spare parts list to maintain the equipment in service for a period of two years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current pricing information.
 - g. Qualification Data: For pump manufacturer and representative.
 - h. Startup and test schedule and procedures in accordance with Division 1.
 - i. Field quality-control reports.
 - j. Shop Testing Reports.
 - k. Operating, maintenance, programming, and wiring instructions for all equipment.
 - l. Tool-free pumphead replacement instructions
 - m. Manufacturer's certification that pumphead, drive, and tubing are all manufactured by the same manufacturer.
4. Operation and Maintenance Manuals.

1.04 WARRANTY

- A. The chemical metering pump manufacturer shall provide a five-year warranty on the peristaltic metering pumps. If the equipment should fail during the warranty period due to a defective part(s), the part(s) shall be repaired or replaced in the equipment and the unit(s) restored to service at no expense to the Owner.

2.00 PRODUCTS

2.01 GENERAL

- A. The equipment, sizes, materials, and arrangements described in this Section are based on recommendations by equipment manufacturers and shall be considered the minimum limits of acceptability.
- B. The piping, valves, and accessories shall support the maximum backpressure shown in the Equipment Schedule. The materials outlined in this specification are the minimum requirement; however, if alternate materials of construction are necessary to accommodate the chemical compatibility and pressure requirement, those materials shall be provided.

2.02 METERING PUMP – PERISTALTIC (TUBING STYLE)

- A. General:
 - 1. The chemical metering pumps shall be positive displacement, peristaltic type pumps, complete with spring loaded or fixed roller pump head, self-contained variable speed drive, flexible extruded tube, and fittings as specified. The pump must be capable of operating in either direction as well as operating in a “run dry” situation with no damage to the pump and hose.
 - 2. The capacity of each pump shall be infinitely adjustable within the specified turndown range.
 - a. The pumping capacity of each pump shall be controlled through the use of an integral variable speed drive and shall be accurate to ± 0.1 percent from setpoint.
 - b. The pump provided shall meet the requirements and capacities as shown in the Equipment Schedule. The maximum pump speed at the design dose provided in the Equipment Schedule shall not exceed 50 percent of the maximum pump speed, unless specifically called for in the Schedule.
 - 3. Each pump shall consist of a spring-loaded track/pump head cover with safety interlock switch, ratchet type tube retainer mechanism, and gear driven roller rotor assembly if applicable or as approved by the Engineer. Pump shall also be allowed to have a fixed pump head with fixed rollers.
 - 4. Each pump shall be capable of self-priming and when completely dry, the peristaltic pump must have a lift capability of up to 27 feet.
 - 5. Chemical Containment:
 - a. During normal operation, the chemical being pumped shall come into contact with tubing interior only.
 - b. If the tube ruptures, the chemical shall be contained within the housing unit and shall not contact any other parts of the pump or gear box.
 - c. Leak Detection – Factory mount a capacitance type tube monitor directly under the pump head or within the pumphead, which shall shut the pump down in the event of a detected leak. Capacitance sensor shall be equipped with a sensitivity adjustment, reset pushbutton, and fault indicator LED.

6. Tubing

- a. The outer diameter tube shall be within tolerances of ± 0.5 mm.
- b. The manufacturer shall verify that the tube material is compatible with the liquid being pumped.
- c. The tubing shall be rated for a continuous operating pressure specified in the Schedule at the end of this Section.
- d. Tubing shall be in contact with the inside diameter of the housing through and angle of 180° and be held in place on the suction and discharge by a spring loaded self-adjusting clamp mechanism if applicable or as approved by the Engineer.
- e. Tubing occlusion shall be fixed or adjustable via adjustment of two knurled nuts with springs to set the force with which the cover will bear down on the tubing. Pumps utilizing fixed roller shall be preset for optimum occlusion and tube life.
 - 1). The knurled nuts shall be fitted with set screws to limit compression.
 - 2). Occlusion shall be factory preset to provide an optimal occlusion.

7. Rotors and Drive Shaft:

- a. Provide rotor assembly that ensures gradual tube occlusion and compensates for tube tolerance:
 - 1). Spring-Loaded Roller Design:
 - a). Twin spring-loaded roller arms located 180 degrees apart, each fitted with stainless steel helical springs and compressing roller for occlusion of the tube.
 - b). Compressing Rollers: 316SS with low friction stainless steel bearings and PTFE seals, minimum diameter 18 mm. Provide non-compressing guide rollers constructed of corrosion resistant Nylatron.
 - c). Clutch: Equip rotor with a central handgrip hub and manually activated clutch to disengage the rotor from the drive for manual rotor rotation during tube loading. Clutch shall automatically reengage rotor to gearbox upon one complete revolution.
 - d). Mounting: To prevent slip, the rotor assembly shall be axially secured to the dogged output shaft of the gearmotor via a slotted collet and central retaining screw.
 - e). Pump heads requiring disassembly or special tools for tube changing are not acceptable.
 - 2). Fixed Roller Design
 - a). Twin roller shafts with chrome plated steel motor shaft and stainless-steel ball bearings located 180 degrees apart fixed proper roller position and complete occlusion of the tube.
 - b). Compressing Rollers: One-piece, corrosion resistant, non-metallic rollers.

- c). Rotor: One piece, corrosion resistant, non-metallic rotor isolated from the gearbox by an EPDM O-ring.
- d). Mounting: To prevent slip, the rotor assembly shall be axially secured to the dogged output shaft of the gearbox via a keyed slot and central 316 SS retaining screw.

B. Drives

1. Rating: Continuous 24-hour operation, 40° C ambient. The pumps will operate inside of a ventilated and heated space; however, the room will be equipped with an air-cooling system.
2. Supply: 120VAC/60Hz, 1 phase.
3. Enclosure: NEMA 4X
4. Housing: Pressure cast aluminum with Alocrom pre-treatment and exterior grade corrosion resistance polyester powder coat. By nature of the environmental conditions, unpainted housings, including 316 SS, are not acceptable.
5. Pumps must meet the following minimum requirements for operator interface functionality. Pumps not meeting this minimum functionality will not be accepted.
 - a. Backlit graphical LCD capable of up to two lines of text with up to 16 characters per line to display pump speed, running status, flow rate, and programming instructions.
 - b. Keypad for start, stop, speed increment, speed decrement, forward/reverse direction, rapid prime, and programming.
 - c. Menu driven on screen programming of manual or auto control, flow and remote signal calibration, and general programming.
 - d. Programmable "Auto Restart" feature to resume pump status in the event of power outage interruption.
 - e. Programmable "Keypad Lock" to allow operator lockout of all keys except emergency start/stop.
 - f. Programmable "Maximum Speed" to allow operator to set the maximum speed of the pump within the limits identified in the Equipment Schedule at the end of this Section.
6. Supply auto control features to meet the following minimum functionality requirements. Pumps not meeting this minimum functionality will not be accepted.
 - a. Remote Control Inputs
 - 1). Speed Control:
 - a). Analog 4-20mA, with input signal trimmable and speed scalable over any part of the drive speed range.
 - b). Provisions for alternative remote accessory potentiometer (if supplied by others).

- 2). Start/Stop Control: via 5V TTL, 24V industrial logic, or dry contact-Configurable command sense allowing open to equal run or open to equal stopped. Configurable to be a keypad start/stop override in Manual mode.
7. Supply auto control features to meet the following minimum functionality requirements. Pumps not meeting this minimum functionality will not be accepted.
8. Pump provider shall provide the following local controls for each pump:
 - a. Start (each pump)
 - b. Stop (each pump)
 - c. Hand/Remote (each pump)
 - d. Speed control
9. Pump provider shall provide the following remote signals for each pump:
 - a. Run command (accept momentary dry contact)
 - b. Speed control (accept 4-20mA).
 - c. Speed feedback (output 4-20mA).
 - d. Auto status (output dry contact).
 - e. Common/General alarm (output dry contact).
 - f. Leak alarm (output dry contact).
 - g. Run status (output dry contact).
- C. Motors: drive motor shall be brushless DC motor with integral gearbox and tachometer feedback or AC motor with a sealed gearbox. The motors supplied shall be specifically designed for inverter duty to allow for the potential of future variable frequency drives. The motors shall be compatible with the pumps provided by the Manufacturer.
 1. DC Motor Control:
 - a. Speed Control Range as specified in the Schedule over the entire range of pump operation. The speed control must be ± 0.1 rpm throughout the range.
 - b. Circuitry complete with temperature and load compensation and protection.
 2. Mounting: Drive shall be self-supporting and shall not require anchoring.
- D. Pumps shall have non-maintained maximum speed switch for the purpose of priming.
- E. Hardware shall be stainless steel.

2.03 METERING PUMP – PERISTALTIC (PUMPHEAD CARTRIDGE)

- A. General:
 1. The chemical metering pumps shall be positive displacement, peristaltic type pumps, complete with pumphead consisting of a sealed track housing with in-line porting, self-contained variable speed drive, flexible extruded tube, and fittings as specified. The pump must be capable of operating in either direction as well as operating in a “run dry”

situation with no damage to the pump and hose. Pumps shall be complete with ReNu replaceable cartridge-style peristaltic pumphead technology.

2. The capacity of each pump shall be infinitely adjustable within the specified turndown range.
 - a. The pumping capacity of each pump shall be controlled through the use of an integral variable speed drive and shall be accurate to ± 0.1 percent from setpoint.
 - b. The pump provided shall meet the requirements and capacities as shown in the Equipment Schedule. The maximum pump speed at the design dose provided in the Equipment Schedule shall not exceed 50 percent of the maximum pump speed.
3. Each pump must consist of a cartridge-style peristaltic pumphead that consist of a sealed track housing with in-line porting. Suction and discharge ports must be 180 degrees apart with bottom suction and top discharge.
4. Each pump shall be capable of self-priming and when completely dry, the peristaltic pump must have a lift capability of up to 30 feet.
5. Discharge Pressure Rating: Up to 60 psi on Qdos 120 and up to 100 psi on Qdos 30 & Qdos 60 continuous (145 psi intermittent for Qdos 30).
6. Pumps shall be capable of pumping both liquids and gases without vapor locking.
7. Pump shall not require the use of back pressure valves, suction foot valves, strainers, pulsation dampeners, or auto degassing valves and shall not require dynamic seals in contact with the pumped fluid. Process fluid shall be contained within pump tubing and shall not directly contact any rotary or metallic components during operation.
8. Chemical Containment:
 - a. During normal operation, the chemical being pumped shall come into contact with tubing interior only.
 - b. If the tube ruptures, the chemical shall be contained within the pumphead and shall not contact any other parts of the pump or gear box.
 - c. Leak Detection
 - 1). The leak detection must utilize a non-contacting optical sensor. The sensor must not come in contact with the process fluid, contain no moving parts, and must not depend on the capacitance of the process fluid. In addition, the sensor must not require fluid to leak out of the pump housing for engagement, nor require any sensitivity or calibration adjustment.
 - 2). In the event of peristaltic element failure, the leak sensor shall shut the pump down immediately with all process fluid contained within the sealed pumphead.
 - a). Sensor type: Utilize non-contacting optical sensor. Sensor shall not come in contact with the process fluid, shall contain no moving parts, shall not depend on the capacitance of the process fluid, shall not require fluid to leak out of the pump housing for engagement, nor shall require any sensitivity or calibration adjustment.

- b). Alarm: Sensor shall shut down the pump, give a visual indication on the drive controller, and if specified shall provide an output general alarm signal.
- c). For operator and environmental safety, pumps which do not have leak containment, leak sensor, and shutdown are not acceptable. For additional overpressure safety, sealed pumphead shall have a controlled drain-to-waste port.

9. Pumphead Cartridge

- a. Technology: Provide tool-free ReNu cartridge-style peristaltic pumphead technology. For operator safety, pumphead must be serviceable as a single replaceable component. Pumps that require an operator to open the pumphead for tube replacement, cleaning, or rebuilding or that require tools for maintenance are unacceptable.
- b. Max rating:
 - 1). Qdos 20 PU – 7.7 GPH at 55 rpm and 100 psi of discharge pressure.
 - 2). Qdos 30 - 7.9 GPH at 125 rpm and 100 psi of discharge pressure.
 - 3). Qdos 60 - 15.85 GPH at 125 rpm and 100 psi of discharge pressure.
 - 4). Qdos 120 - 31.7 GPH at 125 rpm and 60psi of discharge pressure.
- c. Housing construction: corrosion resistant and high impact resistant glass filled PPS or PPE/PS.
- d. The pumphead rotor must be constructed of glass filled Nylon, sealed within the track housing, and supporting by its own bearings. Peristaltic occlusion level must be factory set to ensure flow accuracy of $\pm 1\%$ and repeatability of performance of $\pm 0.5\%$ and must be no require any field adjustment.
- e. Contact materials: All pumphead components in the fluid path must be NSF61 listed and shall be of materials specified by the manufacturer as compatible with the process fluid.
- f. The manufacturer shall verify that the tube material and pumphead is compatible with the liquid being pumped.
- g. The tubing/pumphead shall be rated for a continuous operating pressure of 100 psi.
- h. The pumphead must utilize polypropylene compression fittings that shall mate to 10-mm ID reinforced, transparent PVC interface house. Provide polypropylene compression by $\frac{1}{2}$ " NPT adapters for connecting interface hose to process line.
- i. Spares: Provide one (1) spare pumphead per pump supplied.

B. Drives

- 1. Rating: Continuous 24-hour operation, 45° C ambient.
- 2. Voltage: Drive shall be suitable for 100-240VAC, 50-60Hz, 1- Phase with an internal switch-mode power supply.
- 3. Max drive power consumption: 190VA.

4. Enclosure: NEMA 4X constructed out of corrosion resistant engineered plastic, 20% glass filled PPE/PS. By nature of the environmental conditions, unpainted housings, including 316 SS, are not acceptable. Enclosure must house the drive motor and all control circuitry in one integrated unit. Separate VFDs and motors are not acceptable.
 5. Motors: Drive motor shall be brushless DC motor with integral gearbox and tachometer feedback or AC motor with a sealed gearbox. Circuitry must be complete with temperature and load compensation protection.
 - a. DC Motor Control:
 - 1). Speed Control Range of 1600:1 from 0.1 to 125 rpm ± 0.1 rpm throughout the range.
 - 2). Closed loop microprocessor-controlled drive with pulse width modulation at speeds above 35 rpm and synchronous mode with magnetic field rotation control below 35 rpm.
 - 3). Circuitry complete with temperature and load compensation and protection.
 - b. Mounting: Drive shall be self-supporting and shall not require anchoring.
 6. The pumphead must directly couple to the controller via a splined drive shaft and shall be locked in place by two tool-free thumbscrews or level mechanism.
 7. The pumphead must be fully sealed to prevent any contamination of the controller or drive shaft by process fluid.
 8. The pumphead must contain its own rotor bearings and not impart an overhung load on the pump shaft.
 9. The pumphead must be mounted to the right side of the enclosure, or as indicated on the Drawings.
 10. Drive must stop shaft rotation and give a visual alarm in the event the pumphead is removed.
- C. Human-Machine Interface (HMI) and Control
1. Pumps must meet the following minimum requirements for operator interface functionality. Pumps not meeting this minimum functionality will not be accepted.
 - a. Backlit graphical TFT/LCD capable of up to eight lines of text with up to 26 characters per line to display pump tag number, flow rate, pump speed, running status, flow rate, and programming instructions.
 - b. Keypad for start, stop, speed increment, speed decrement, forward/reverse direction, rapid prime, and programming.
 - c. Menu driven on screen programming of manual or auto control, flow and remote signal calibration, and general programming.
 - d. Programmable "Auto Restart" feature to resume pump status in the event of power outage interruption.
 - e. Programmable "Keypad Lock" to allow operator lockout of all keys except emergency start/stop.

- f. Programmable “Maximum Speed” to allow operator to set the maximum speed of the pump.
- 2. Supply auto control features to meet the following minimum functionality requirements. Pumps not meeting this minimum functionality will not be accepted.
 - a. Remote Control Inputs
 - 1). Speed Control:
 - a). Analog 4-20mA, with input signal trimmable and speed scaleable over any part of the drive speed range.
 - b). Provisions for alternative remote accessory potentiometer (if supplied by others).
 - 2). Start/Stop Control: via 5V TTL, 24V industrial logic, or dry contact-Configurable command sense allowing open to equal run or open to equal stopped. Configurable to be a keypad start/stop override in Manual mode.
- 3. Self-contained Variable Frequency Drive (VFD) provided by the chemical feed pump manufacturer shall be responsive to a 4-20 mA input signal and shall output a 4-20 mA return speed signal.
- 4. Pump provider shall provide the following local controls for each pump:
 - a. Start (each pump)
 - b. Stop (each pump)
 - c. Hand/Remote (each pump)
 - d. Speed control
- 5. Pump provider shall provide the following remote signals for each pump:
 - a. Run command (accept momentary dry contact)
 - b. Speed control (accept 4-20mA).
 - c. Speed feedback (output 4-20mA).
 - d. Auto status (output dry contact).
 - e. Common/General alarm (output dry contact).
 - f. Leak alarm (output dry contact).
 - g. Run status (output dry contact).
- D. Pumps shall have non-maintained maximum speed switch for the purpose of priming.
- E. Hardware shall be stainless steel.

2.04 ACCESSORIES

- A. General:
 - 1. Accessories listed below shall be furnished by the System Integrator.

- B. Equipment Identification Plates: A 16-gauge stainless steel identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear ¼-inch die-stamped equipment identification number indicated in this Section and/or on the Drawings.

2.05 SPARE PARTS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Provide spare parts as recommended by the manufacturer, including but not limited to the following:
 - b. Metering Pump – Peristaltic (Tubing Style)
 - 1). Five (5) tube kits per pump.
 - 2). One (1) pump head/Rotor assembly per pump model.
 - c. Metering Pump – Peristaltic (Pumphead Cartridge Style)
 - 1). Five (5) pumphead cartridges per pump.
 - 2. Special tools necessary to maintain the equipment.

3.00 EXECUTION

3.01 INSTALLATION

- A. The Contractor will install and adjust the equipment in accordance with the Drawings, approved shop drawings, and the manufacturer's instructions. Do not operate the equipment until the manufacturer's representative approves the installation.
- B. Upon completion of installation, the Contractor shall submit a certificate from the Manufacturer stating that the installation of the equipment is satisfactory that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation of each unit.

3.02 ASSEMBLY AND INSTALLATION

- A. The Contractor shall assembly and install the Chemical Metering Pump per the manufacturer's instructions.
- B. Contractor shall supply shielded signal wiring for wiring of the required remote input and output to the connectors.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of the equipment, check unit for excessive noise, vibration, alignment, general operation, etc. Unit must perform in a manner acceptable to the Engineer before acceptance of installation is made by the Owner.
- B. Perform an inlet vacuum test as recommended by the manufacturer.
- C. Field Leak Testing

1. In addition to the factor leak testing, each chemical feed system shall be pressure and leak tested in the field after installation.
 2. Testing shall be considered satisfactory when no pressure loss is measured and there are no visible leaks.
- D. Upon acceptance of installation of the chemical feed equipment, complete a performance acceptance test. Test pumping unit to determine whether or not it is capable of supplying specified flow rates at specified discharge pressure. Test pumping units at 100%, 75%, 50% and 25% of capacity on two (2) consecutive days. Forms to be used during acceptance and performance tests are provided by the Engineer. Manufacturer's representative(s) shall remain in residence for the duration of testing. Sampling and analytical support (chemical, power, labor, etc.) shall be the responsibility of the Manufacturer.
 - E. Commence acceptance tests at a date which is mutually agreeable between parties, but not longer than three (3) months after completion of installation. Installation shall include electrical checkout of control panels or loops.
 - F. Determine performance of the equipment supplied from an average of the measured pumping rates. Average pumping rate from the equipment unit being tested shall not exceed a maximum of plus or minus 5% of specified pumping rate.
 - G. If, during initial acceptance test, equipment fails to perform to the process requirements of the specifications, a second test will be granted under conditions specified for initial test. Perform second test within two (2) weeks of completion of first test.
 - H. If, at completion of first test (or second test), performance meets specified process requirements and equipment is accepted by Owner, final payment shall be made to the Contractor.
 - I. If, at the completion of the second test, Manufacturer is unable to make necessary corrections, modifications, or changes to equipment in order for specified acceptance tests to meet process guarantee, Manufacturer shall be responsible for all costs to replace deficient equipment with equipment which does meet those requirements.

3.04 SCHEDULE I

- A. The available pump speeds and flows and with the corresponding design flow and speeds are summarized below:

Manufacturer and Model Information	Available Speeds (rpm)	Available Flows (gph)	Design Flows (min/max/design) (gph)
Watson Marlow Qdos 20 PU	0.017 - 55	0.001 – 7.7	0.10 / 0.64 / 0.32

END OF SECTION